ELECTRICAL REVIEW

[ILLUSTRATED.]

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The Western Union Telegraph Company Ordered to Pay a Tax of $10,618.46.

Judge Colt, of the United States Circuit Court, has just given a decision in the case of the Attorney-General of Massachusetts against the Western Union Telegraph Company, ordering a decree for the complainant. This was an information filed by the Attorney-General under Chapter 13 of the Public Statutes of Massachusetts, to collect a tax claimed to be due, and for an injunction restraining the defendant from further prosecution of its business until such tax is paid.

It appears that the information was filed in the State Court April 27, 1886, and removed by the defendant to this court; that in May, 1885, defendant owned or controlled, under lease or otherwise, 146,052.60 miles of telegraph lines, of which 21,833.05 were situated in Massachusetts. In September, 1885, the Tax Commissioner, in the manner required by the laws of the State, estimated the fair cash valuation of the stock of the corporation on May 1, 1885, at $47,500,000, and allowed as credits for shares held by the company unissued, and stocks in other companies outside of its system, $8,773,622.70, leaving $38,713,924.

The commissioner considered the valuation of the corporate franchise of the defendant subject to taxation in the State to be $750,952, and ordered a tax thereon of $10,618.46. More than 2,334.55 miles of the line within the State are over, under, or across post roads, but the commissioner ignored this fact. The court found, as a fact, that it is impossible for the company to determine what portion of any sums received were for services performed in the State, in the transmission of messages received or delivered out of it, or what portion of any sums received were for services not on lines of said post roads, but approximately 70 per cent. of the receipts were for messages received and delivered out of the State.

The defendant, on May 1, 1885, owned a large amount of real estate subject to local taxation out of the State of Massachusetts, on which there was assessed and paid more than $48,000, but in the assessment of the tax by the commissioner, no allowance was made for this. The defendant contended that the tax levied was illegal, first, because of its operation and effect upon a franchise granted by the United States, and used for its purposes and benefit; second, because it is a tax upon interstate or foreign commerce; third, because it is in effect levied upon real estate located and taxed in another State. Judge Colt makes a careful examination of the evidence, and finds that none of the grounds of the defense can be sustained, and says: "I think a decree should be entered for the complainant, and that injunction as prayed for should be granted, unless the amount taxed is paid by the defendant within 30 days from the entry of a decree in the cause." The defendant will probably appeal to the United States Supreme Court.

Mr. Edward A. Leslie has been appointed general manager of the New York Accumulator Company, 18 Cortlandt street. This company is a licensee of the Electrical Accumulator Company, of 44 Broadway.

The Florida Electrical Society.

The enterprising electrical workers of Florida are not going to be left in the matter of organization. At Jacksonville the Florida Electrical Society has been formed, with the following officers:

B. F. Dillon, president; L. E. Spencer, first vice-president; W. R. Davis, second vice-president; G. W. Davis, of Palatka, third vice-president; J. S. Arnold, of Sanford, fourth vice-president; E. B. King, secretary; D. J. Crowley, treasurer; R. B. Rood, librarian.

The objects of the society are, the advancement of electrical knowledge among its members; the establishment of a library, a reading room and a laboratory; and the holding of periodical meetings, at which the reading of scientific papers and their discussion are to be the leading features. The members are enthusiastic over the inauguration of the society, and Mr. Dillon is very much interested in it.

Mr. Samuel Insull, manager of the Edison works at Schenectady, N. Y., was in New York city consulting with Mr. Edison, last week. The works are very busy, and the new department devoted to insulated wire is being rushed with orders.

The Carpenter Automatic Electric Air-brake Company, Chicago, has been incorporated. Capital stock, $1,000,000. Incorporators, R. E. Beebe, W. H. Wiswell and E. F. Lawrence.

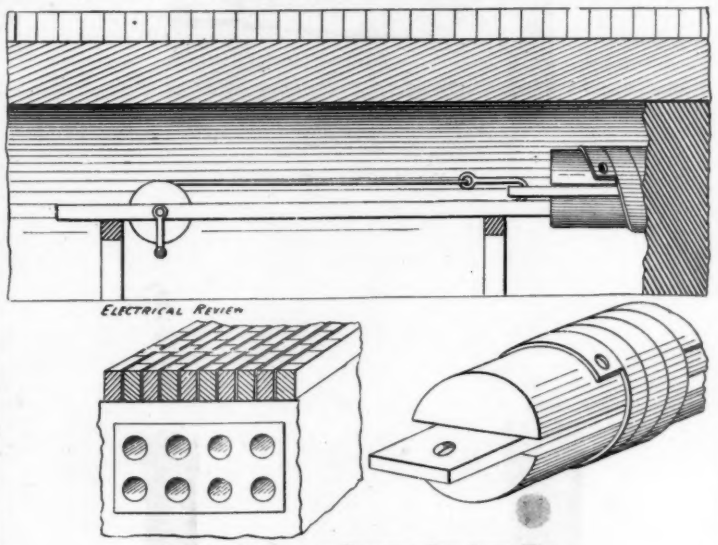


FIG. 2.—METHOD OF DRAWING OUT CORE, ETC.

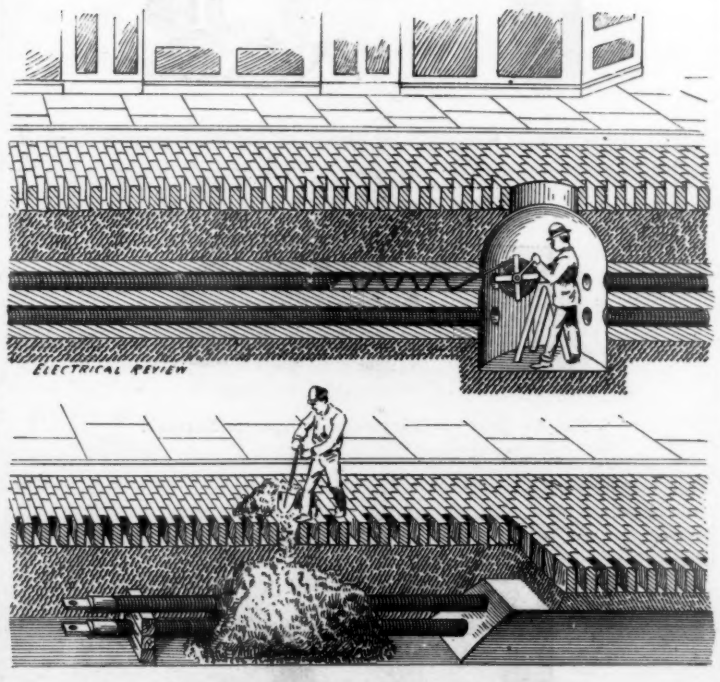


FIG. 1.—CHENOWETH CONDUIT FOR ELECTRICAL WIRES.

The Chenoweth Conduit for Electrical Wires.

To the Editor of Electrical Review:

The subject of sub-electrical conduits occupies much thought as one of the uppermost questions of interest, attracting the attention at once as an important subject for consideration in view of the constant demands for the application of electricity increasing daily by the addition of some new invention. Numerous obstacles must be overcome in order to arrive at a proper arrangement of the underground system of electrical wires and a perfect system of distribution.

Without dealing with the many contrivances and methods that have up to the present time been presented, I will proceed to explain a method of constructing sub-electrical conduits that recommends itself for simplicity and cheapness, securing absolute durability, is impervious to water, and is without joints, being continuous.

The requirements of a sub-electrical conduit which are about determined in the minds of our electrical engineers are:

First.—The conduits must be tubular and so arranged as to enable cables to be drawn in, old cables removed by means of manholes located at intervals along the line of conduits, from the manholes auxiliary conduits to project to houses and lamps in order to make connections.

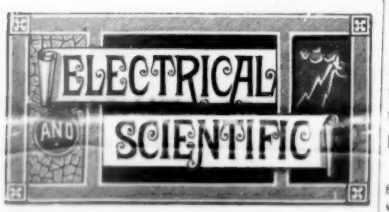
Second.—The material used must be able to withstand the destructive effects of sewer gases, moisture, and air, frost, steam heating pipes, together with an established inductive current that is a certain cause to hasten chemical decomposition, coupled with the other conditions that are sure to be present.

Third.—The cost must be within reach of all the electrical companies, as they have expended large sums for erection of wires above ground.

Many patents have been granted for electrical conduits, and the material from which they are made is costly and destructible when brought to a test. I will not deal with each, either for comparing their merits or demerits, but will proceed to explain the method employed by the Chenoweth Conduit Company under the Chenoweth patents as illustrated in this article. The inventor, Mr. A. Crawford Chenoweth, C.E., is assistant engineer on the new Croton aqueduct, New York city.

A mixture of sand and hydraulic cement has been adopted in proportion of one cement to one of sand for an even and smooth surface for interior of conduits. As this is by far the cheapest material known, besides its permanent character under all the destructive conditions mentioned, places it first in list of materials that enter into construction of conduits. While the use of any material that can be reduced to a plastic state and afterwards hardens can be employed to construct conduits under the method about to be described.

A wooden cylindrical rod, made in lengths of 14 feet or 20 feet are cut in two, forming two-half cylinders. The spaces removed by sawing through the rods when each of the halves are placed together, is occupied by an iron rod having a thickness equal to the portion removed by saw, restoring the cylin-



* * The American Electric Company of Baltimore has been incorporated by Thos. J. Shryock, John H. Fowler, Robt. Turner, Wm. A. Dunn, Solomon Strauss, F. P. Stevens and Wm. H. Crawford. A meeting of incorporators was held, and the following officers elected: Thomas J. Shryock, president; Wm. A. Dunn, vice-president and general manager; John H. Fowler, treasurer; C. Whiteley, secretary, and F. P. Stevens, counsel. Steps will be taken immediately to erect a complete electric light plant, both for street lighting and an incandescent system for offices, dwellings, etc. The system to be used is that of the American Electric Company, of New York.

* * A dispatch from Spokane Falls, W.T., Nov. 1st, says that Tuesday night about 10.50 o'clock, while the sky was overcast with heavy clouds and light rains were falling, a meteor was seen by a number of people to shoot from the heavens directly overhead. It struck the electric light wires on the south side of Main street, between Howard and Mill streets, in the very heart of the city, cutting one of the wires in two and bursting into thousands of fragments. Those who saw the strange phenomenon say that when it struck it had the appearance of a ball of fire which looked to be ten feet in diameter.

* * When the electric light plant was established at Asheville, N. C., about a year ago, it was considered by many as an experiment, so far as the financial success of the company was concerned. The Asheville Electric Light Company was thought by many to be making a mistake in fixing the enterprise with such extensive capacity. But one year's experience has proved the wisdom of the management, and yesterday the superintendent of the works here left for Indianapolis and other cities North, for the purpose of securing additional machinery and supplies for extending the original plant here. Another object of the superintendent's trip is to carefully inspect electric motors, for the purpose of running small machinery.

* * Mayor Babcock, of Cleveland, at the solicitation of Ex-Mayor Gardner, recently wrote to Washington asking whether or not the government would pay for telephone service at the Cleveland Life Saving Station. There is a telephone in service at the station, but it is paid for by vessel men and citizens who appreciate its value, but the rental will expire at the close of the season. The Mayor received an encouraging answer from Gen'l Superintendent Kimball, of the Life Saving Service, inquiring for particulars and the cost. The value of the telephone in the Life Saving Service was thoroughly established by the prompt aid which it brought to the wreck of the schooner Zach Chandler near Cleveland and the recent wreck of a vessel near Chicago.

* * After several months of hard work, the underground wire committee, of Detroit, have reported their findings to the council. They declare that the underground conduits in use in Chicago and other cities are not so expensive as to be impracticable; that the Edison company is successfully operating 10 miles of wires underground in Detroit. The committee finds also that to supply the half-mile circuit will require only five miles of conduit. In connection with this report, Ald. Trombly offered several resolutions. One was instructing the city clerk to personally serve a properly attested notice to go underground upon all electric light, telephone and telegraph wires. Another resolution instructs the city controller to see that the notice is enforced. Separate resolutions for each company were submitted, requiring them to place all wires within the one-mile circuit underground by July 1, 1888. The resolutions were duly received and ordered printed.

Personal.

Mr. F. A. Cheney, the handsome general manager of the Elmira Illuminating Company, was a New York visitor last week, arranging with the engine men for additional power for his new station.

Mr. E. I. Garfield, secretary of the Thomson-Houston Company, has returned from a South and West trip, much refreshed by his vacation—the first in about ten years.

Mr. Geo. F. Parmelee, president of the Edison Company at Topeka, Kansas, is in the East, investigating electrical work. His company is succeeding finely.

Messrs. L. W. Burnham, of Boston, and H. A. Cleverly, of Philadelphia, were entertained at the Hotel Lafayette, Philadelphia, by Mr. A. L. Bogart and bride. These well known electric gas lighting men had a pleasant meeting.

—— The Taylor Manufacturing Company, of Chambersburg, Pa., have recently sold the following Beck Horizontal Automatic engines for electric light service: An 18½x24 227 horse power engine, for the Thomson-Houston station at Augusta, Ga.; a 11½x15 83 horse power engine to the Wissahicken Electric Light Company, Philadelphia, Pa.; a10½x12 67 horse power engine, for the Honesdale Electric Light Company, Honesdale, Pa.; a 9½x12 57 horse power engine, for the State Industrial School, Kearney, Neb.; a 10½x12 67 horse power engine, for the Gas and Electric Light Company, Sturgis, Mich.

—— The works of the Solar Carbon Company, Pittsburgh, burned down last Friday. This is a loss of $20,000, and throws a number of men out of employment.

——John Buckley, of Meriden, caught a snapping turtle and took it to the telephone office where he works. He thought that he would kill the animal by electricity, and so put the end of a wire in front of it, and the turtle snapped at it and held on. Then Buckley put another wire under the shell and turned on the entire electric current of the office. The turtle shut his jaws tighter and closed his shell, and in five minutes was apparently as dead as Julius Cæsar, but the next morning he was walking around the office quite heartily. It had received an electric shock powerful enough to kill a man.

A Method of Making a Selenium Cell of Constant Resistance.

M. Mercadier promises shortly to explain a new system of multiple telegraphy based upon the employment of the selenium cell, of which, as is well known, he has made a special study. In the year 1881, M. Mercadier first described a method of making a low-resistance selenium cell for use as a radiophone receiver. This method consisted in taking two thin strips of brass, separated by a sheet of paper, and drawing a stick of melting selenium along the edges. It was, however, found that the selenium deposited in this way was very apt to scale or chip off, and, moreover, it was almost impossible to make two cells of this pattern which should have the same resistance. He therefore constructed a somewhat different form of cell, which, although now described (in the *Comptes Rendus*) for the first time, has yet remained unaltered in resistance for over six years, and it has also been found an easy matter to make other cells of the same resistance. A pair of platinum wires are accurately laid down in the form of a double spiral upon a sheet of emery paper. The ends of the wires are attached to two separately insulated blocks of brass, upon which the emery paper rests. The whole is then heated to the melting point of selenium, and a stick of that material is drawn around the double spiral. This would scarcely seem to be a very easy mode of constructing a set of identical cells, but in M. Mercadier's hands the results obtained are excellent. Several cells made at different periods since 1881 have each a resistance of about 300,000 ohms, and have not varied since their first measurement.

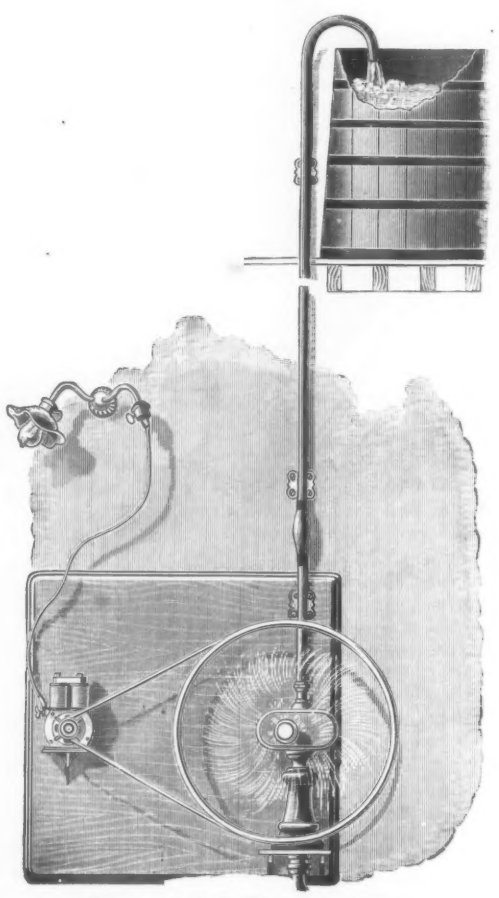


Fig. 2.—C. & C. Motor and Pump.

—— The Citizens' Electric Railway Company of Buffalo, N. Y., has been organized with the following officers: President, A. P. Wright; vice-president, Michael Nellany; secretary, Francis F. Fargo; treasurer, Michael Nellany. From the title of the company it will be seen that electricity is the only motive power that has been considered. It is probable that the storage battery system will be adopted, or possibly the Bentley-Knight underground system, which has been experimented with in other cities.

The Industrious Gas Meter.

Oh, gas may escape, and gas may burst
And vanish in noise and flame,
But the meter's hand, in its quiet way,
Goes traveling onward, day by day,
And gets there just the same.

C. O. R.

The Topeka Tower.

The fall of the electric light tower in Topeka, Kas., rather cooled the ardor of that city to close its contract with the Brush Electric Light Company for a tower system of electric lights. President Baker, of the company, has now sent the following communication to the Topeka Council:

To the Mayor and Council.—In accordance with your request on the 11th of July, we made you a proposition to erect seven towers at such points as you might designate, and to light eight towers, four 2,000 candle power lights on each tower, for the sum of $9,000 per year for five years. In that proposition we were to have use of the tower that was then on the corner of Kansas avenue and Tenth street; since that time the tower has fallen down, not through any fault of its construction, but through its not being taken care of by its owners, the city. You accepted that proposition, since which time no further action has been had by you. We now renew the offer, agreeing to put up the eighth tower at our own expense on the same conditions that we asked for in regard to the other seven towers. We wish to say in this connection that we have been in correspondence since that time with the authorities of many cities which light their streets on the tower system. There are a large number of cities in the United States which do this, and in no town have they been discontinued, but give universal satisfaction.

F. P. Baker,
President Brush Electric Light Company.

—— Those delights of the chestnut-mongers, the tall electric light towers in Union and Madison squares, will soon cease to afford opportunity for the perpetration of the snare beginning thus: "Say, they're not going to have the electric light poles any longer." This time, however, it is not because they are long enough, but because they are too short. Experience has discovered the fact that the massing of the lights at the altitude in use, while it affords plenty of illumination within a given radius, leaves a great part of the parks in question in all the deeper shadow. Hence the commission having charge of the lighting of the city has decided to discontinue the use of the long poles and ordered in their stead 30 electric lamps, which will shine instead of the gas which formerly diffused its rays from as many lampposts of ordinary caliber. It is anticipated that the new lights will utterly dissipate the shadows which have hitherto infested the borders of the parks, and render bench spooning one of the lost arts.

—— Garden City, Kansas, is still without electric lights. The papers of that city are anxious to have an electric light system, and one makes the following suggestion: "Several propositions have been made to our people to put in an electric light plant, but the city council has not seen fit to grant any of the firms or companies seeking it a franchise on the terms they have offered. The council is composed of good business men, and we take it, without an examination of the offers made, that they have acted wisely. But Garden City is far behind the times and all its neighbors, as long as she is without an electric light system. It is a necessity, a luxury, and a matter of pride. Therefore it is due the city that the council take action itself in regard to the establishment of an electric light system here. The best terms that the city can offer any company should be published, and also whatever special inducements there may be. It occurs to the writer that inasmuch as the engines at the waterworks furnish a surplus power, some arrangements could be entered into with some electric light company which would give the city twelve or fifteen street lamps at a nominal cost, in return for giving the company the surplus power at the waterworks. The company could reap sufficient profit from the lights furnished the business houses and residences."

The Improvements in the C. & C. Motor.

We illustrate in this edition several views of the C. & C. motor, and other apparatus used with them. The one horse power incandescent motor is intended for 110 volts to run at constant speed with varying load. Starting and stopping the motor is controlled by a switch which is mounted directly on the field magnets. One feature of the C. & C. motor is the brush holder, which, by holding the brush against the commutator with spring pressure is arranged so that when the brushes are lifted a certain distance from the commutator the springs are thrown out of action and the brushes latch in that position.

All of these machines are made with interchangeable parts—which is the invariable practice of this company with all the goods manufactured, and the electrical data is all stamped on suitable blank places on the name plate. This is frequently done to a limited extent, but not, as a rule, so generally and so completely as by this company.

The arc motor is gotten up specially for safety. It is so arranged that while you can regulate the motor completely you have no power to break the circuit, and as the power of the motor is reduced by the regulator, the resistance which it presents to the main line circuit is also reduced, so that when you turn the switch towards zero power you not only reduce the counter-electromotive force which the motor is capable of generating, but you reduce its resistance until, when you reach the last contact, the motor itself forms a short circuit. The field and armature are connected in parallel, and the field is divided into a number of sections in series. The switch short-circuits these sections, thereby short-circuiting the field, and also forming a shunt around the armature.

The small motor, Fig. 3, is shown on a wall bracket for running a pump or fan. The motor is placed high up out of reach, and is controlled by a regulator similar to the one of the larger machine which is controlled by cords reaching down from a cross-arm as illustrated, which makes a very neat and compact appearing apparatus, attractive as well as efficient.

The sliding base, Fig. 4, is a convenient mounting for the motors, particularly in cases where a new belt is used, and it is necessary to tighten it from time to time.

These new and improved motors are the result of very careful and thorough work on the part of Mr. S. S. Wheeler, manager and electrician of the company. They are now being manufactured on a large scale, and the company's factory at 90 South Fifth Avenue is turning out handsome and most creditable work.

—— The Deer Park Development Company, of Los Angeles, Cal., proposes to provide water power for all railroads run by electricity, and to erect and maintain electric lighting plants in all towns where it is desired.

—— Holmes, Booth & Haydens are almost unable to keep up with their orders for the smaller copper wires—covered—the increase in incandescent electric lighting having created this great demand. There is no branch of electrical business so active as that of incandescent lighting; and the manufacturer who had a large accumulation of the finer covered wires at the beginning of the season has had his heart made happy and his pocket-book plethoric by the unprecedented demand.

—— Col. C. H. Howland, manager of the Pico Street Electric Railway, Los Angeles, Cal., states that on the electric homestead tract there was a large amount of building contracted for, but at present it was almost impossible to get enough hands to do the work. A number of new residences had been recently erected, and others will be built as soon as labor can be procured. He also stated that out on the new or proposed extension of that railway a large number of fine residences were to be erected in the near future, but that out there the people complained of the scarcity of good workmen.

—— The New York Club has contracted for an isolated Edison plant of 300 light capacity.

—— The Brush Electric Illuminating Co. has declared a quarterly dividend of two per cent., payable Dec. 1st, at Nos. 204-210 Elizabeth street, New York City.

—— The Empire City Electric Company, 15 Dey street, since getting well established in its extensive downtown headquarters, has met with most gratifying patronage. General Manager Blasdell reports the electric light trade as particularly active.

—— The Knoxville (Tenn.) Car Wheel Co. will erect an electric plant at their works.

—— The Sub-Tropical Exposition Co., Jacksonville, Florida, are negotiating for the erection of an electric light plant.

—— The Jenny Electric Light and Power Co., of Nashville, Tenn., has been incorporated by A. C. Green, W. H. Smith and others.

—— At Hoosick Falls, N. Y., Messrs. Holmes, Lock & Hurd have been granted the franchise to erect and operate an electric plant. It will be completed by January 1st.

Fig. 4.—Sliding Base, C. & C. Motor.

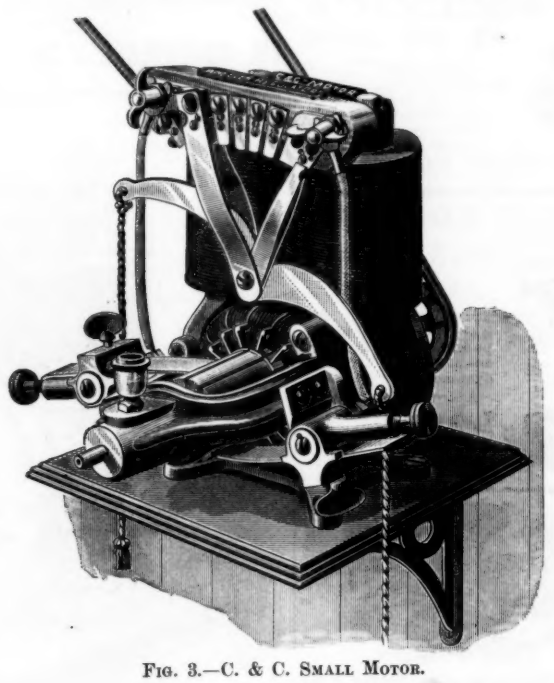


Fig. 3.—C. & C. Small Motor.

Fig. 1.—Arc Motor, C. & C. Company.

—— The machinery for the electric light plant at Council Grove, Kas., has been ordered.

—— A correspondent writes to the *London Electrician* from Madeira, saying: "I shall feel much obliged if you will kindly draw the attention of your numerous readers to the fact that the Municipality of Funchal have published an advertisement in the *Diario de Noticias*, inviting tenders for lighting the new theatre 'D. Maria Pia,' and the city of Funchal with electric light. Applications for plans and all particulars should be addressed to the President of the Municipality, the Visconde do Ribeiro Real, Funchal, Madeira."

—— According to Dr. Schilling, the number of electric light installations in the thirteen principal towns of Germany has increased during the last two years from 131 to 604; the number of arc lamps has increased from 591 to 3,280, and the number of incandescents from 10,403 to 50,469. The number of gas lamps in these thirteen towns is 1,221,882, and therefore, lamp for lamp, electricity furnishes about 4 per cent. of the total illumination. In Munich this proportion is as high as 8 per cent. According to another authority there are in Hamburg at the present time 78 installations of electric light; 325 arc lamps and 5 300 incandescents About 1,000 horsepower is employed for these installations, of which one-fifth is furnished by gas engines.

ELECTRIC LIGHT NEWS

—— Burton, Kansas, has decided in favor of electric lights.

—— The Chicago Gas Trust is having a stormy time just at present.

—— G. P. Warner has made a proposition to erect an electric lighting plant at Orange, Mass.

—— The wire manufacturers met in New York last week and conferred over the price of wire.

—— The new Broadway Theater is to be lighted by electricity. The Edison system will be used.

—— The Thomson-Houston Company has been awarded the contract for electric lighting at Arlington, N. J.

—— Glendale, Ohio, would like the electric light for five years. Mr. Alfred M. Allen, of that city, is interested.

—— The Vienna opera house is to be lighted with electricity; 744 horse power boilers (Babcock & Wilcox) will be used.

—— All the stock of a $10,000 electric light company has been subscribed for at Hutchinson, Kas., and the plant will be put in at once.

—— The Commercial Cable Company's repair ship, Captain Trot in command, has had a copy of Mr. S. S. Wheeler's new wire gauge framed and placed in the cabin for reference.

—— H. H. Corson, representing the Thomson-Houston Electric Light Co., of Boston, Mass., is negotiating for the erection of electric light plants for Bristol, Tenn., and Goodson, Va.

—— The Passaic City Light, Heat and Power Company has been organized and applied to the city council for permission to run wires throughout the city for lighting dwellings and stores.

—— At Alton, Ill., the gas committee of the council has reported in favor of the substitution of twenty electric street lights, in place of others to be removed, and recommended that the contract be given to the electric light company now holding the privilege. The report was adopted, and the committee empowered to make it.

—— A gigantic dynamo for the works of the Cowles Electric Smelting and Aluminum Company, at Stoke-on-Trent, England, is now in course of erection. The machine has been built by Messrs. R. E Crompton & Co., of the Arc Works, Chelmsford, and will have, it is said, a minimum capacity of 300,000 watts, requiring 500 horse power to drive it.

—— The Elmira (N. Y.) Illuminating Co., Mr. F. A. Cheney, manager, is improving its plant to conform with the wide-awake and businesslike methods that characterize the work of Mr. Cheney. A large new station is in course of construction, and a 500 horse power (Watts-Campbell) engine has been added to the present power. There are over 5,000 incandescent lamps in use in that city, and 100 arc—a remarkably good showing for the little city of Elmira. Both the United States and Thomson-Houston systems are used.

—— Chas. A. Schieren & Co. report sales of electric leather belting to the following parties during the past week: Glens Falls Electric Light and Power Co., Glens Falls, N. Y., 56 feet 8-inch double belt, 33 feet 10-inch double belt; Edison Electric Light Co., York, Pa., 60 feet 5-inch double belt, 30 feet 8-inch double belt; Skowhegan Electric Light Co., Skowhegan, Me., 58 feet 9-inch double belt; Allbright's Sons & Co., Allentown, Pa., 30 feet 10-inch double belt; H. L. Childs & Co., Pittsburgh, Pa., 79 feet 24-in. double belt; Cross, Austin & Co., Brooklyn, N. Y., 52 feet 15-inch double belt; Geo. W. Childs, Philadelphia, Pa., 90 feet 8-inch double belt.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING NOV. 22, 1887.

373,435 Galvanic battery; Horatio J. Brewer, New York, N. Y.

373,508 Printing telegraph; Charles J. Wiley, Brooklyn, N. Y.

373,519 Telephone apparatus; Isaiah H. Farnham, Malden, Mass., assignor to the New England Telephone Co., New York, N. Y.

373,584 Dynamo electric machine; Thomas A. Edison, Llewellyn Park, N. J.

373,691 Apparatus for purifying and separating fatty substances by electricity; Heinrich F. D. Schwahn, Kansas City, Mo.

373,739 Prevention of sparking in electric motors and generators; Daniel Higham, Philadelphia, Pa., assignor to the Higham Electric Motor Company, same place.

373,759 Electric coupling; George W. Taylor, Leavittsburg, Ohio.

373,761 Electric arc lamp; Gustav A. Wiese, San Francisco, Cal.

373 767 Device for attaching tablets to telephones, Howard H. Butler, Canton, Ohio, assignor of one-half to Charles C. Cook, same place.

Business Notice.

At a fire in the Saratoga Hotel recently the alarm was given from the office to the guests in their rooms by the Fire Alarm and Guest Call put in by the Western Electric Company, "and many lives were saved thereby," the architect of the building says.

The following letter in regard to the Western Electric Company's hotel apparatus testifies to the merits of this system:

ST. LOUIS, Mo., Oct. 28, 1887.

WESTERN ELECTRIC COMPANY,
CHICAGO.

GENTLEMEN: Please find inclosed my check in payment of the accompanying bill.

Permit me to say that the system is working with admirable success, and is giving excellent satisfaction. I am much pleased with its introduction into my hotel, and pay this bill with much cheerfulness, believing that I am getting full value received for the money. Yours truly,

(Signed) J. L. GRISWOLD.

William Marshall,
Manufacturer of ELECTRICAL CONDENSERS.
STANDARDS A SPECIALTY.
Rooms 2 and 4 University Building.
Corner Waverley and University Places, New York.

WHEN WRITING for Catalogues & ordering Articles advertised in our columns please mention that you saw the advertisement in the ELECTRICAL REVIEW.

PATENTS.

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Conducts a general business in the preparation and prosecution of Applications for Patents, in the United States and all Foreign Countries. All business carefully and promptly attended to in the matter of Reissues, Caveats, Trade Marks, Labels, Design Patents, Copyrights.

SPECIAL SEARCHES made to determine the question of novelty or infringement.

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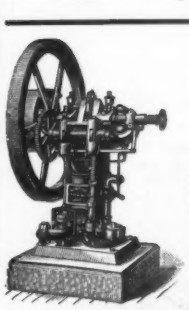

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[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

Vol. 11 No. 15. WEEKLY. | NEW YORK, SATURDAY, DECEMBER 10, 1887. | $3 per annum. Single Copies, 6 Cents.

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The Western Union Telegraph Company Ordered to Pay a Tax of $10,618.46.

Judge Colt, of the United States Circuit Court, has just given a decision in the case of the Attorney-General of Massachusetts against the Western Union Telegraph Company, ordering a decree for the complainant. This was an information filed by the Attorney-General under Chapter 13 of the Public Statutes of Massachusetts, to collect a tax claimed to be due, and for an injunction restraining the defendant from further prosecution of its business until such tax is paid.

It appears that the information was filed in the State Court April 27, 1886, and removed by the defendant to this court; that in May, 1885, defendant owned or controlled, under lease or otherwise, 146,052.60 miles of telegraph lines, of which 21,833.05 were situated in Massachusetts. In September, 1885, the Tax Commissioner, in the manner required by the laws of the State, estimated the fair cash valuation of the stock of the corporation on May 1, 1885, at $47,500,000, and allowed as credits for shares held by the company unissued, and stocks in other companies outside of its system, $8,773,622.70, leaving $38,713,924.

The commissioner considered the valuation of the corporate franchise of the defendant subject to taxation in the State to be $750,952, and ordered a tax thereon of $10,618.46. More than 2,334.55 miles of the line within the State are over, under, or across post roads, but the commissioner ignored this fact. The court found, as a fact, that it is impossible for the company to determine what portion of any sums received were for services performed in the State, in the transmission of messages received or delivered out of it, or what portion of any sums received were for services not on lines of said post roads, but approximately 70 per cent. of the receipts were for messages received and delivered out of the State.

The defendant, on May 1, 1885, owned a large amount of real estate subject to local taxation out of the State of Massachusetts, on which there was assessed and paid more than $48,000, but in the assessment of the tax by the commissioner, no allowance was made for this. The defendant contended that the tax levied was illegal, first, because of its operation and effect upon a franchise granted by the United States, and used for its purposes and benefit; second, because it is a tax upon interstate or foreign commerce; third, because it is in effect levied upon real estate ocated and taxed in another State. Judge Colt makes a careful examination of the evidence, and finds that none of the grounds of the defense can be sustained, and says: "I think a decree should be entered for the complainant, and that injunction as prayed for should be granted, unless the amount taxed is paid by the defendant within 30 days from the entry of a decree in the cause." The defendant will probably appeal to the United States Supreme Court.

Mr. Edward A. Leslie has been appointed general manager of the New York Accumulator Company, 18 Cortlandt street. This company is a licensee of the Electrical Accumulator Company, of 44 Broadway.

The Florida Electrical Society.

The enterprising electrical workers of Florida are not going to be left in the matter of organization. At Jacksonville the Florida Electrical Society has been formed, with the following officers:

B. F. Dillon, president; L. E. Spencer, first vice-president; W. R. Davis, second vice-president; G. W. Davis, of Palatka, third vice-president; J. S. Arnold, of Sanford, fourth vice-president; E. B. King, secretary; D. J. Crowley, treasurer; R. B. Rood, librarian.

The objects of the society are, the advancement of electrical knowledge among its members; the establishment of a library, a reading room and a laboratory; and the holding of periodical meetings, at which the reading of scientific papers and their discussion are to be the leading features. The members are enthusiastic over the inauguration of the society, and Mr. Dillon is very much interested in it.

Mr. Samuel Insull, manager of the Edison works at Schenectady, N. Y., was in New York city consulting with Mr. Edison, last week. The works are very busy, and the new department devoted to insulated wire is being rushed with orders.

The Carpenter Automatic Electric Air-brake Company, Chicago, has been incorporated. Capital stock, $1,000,000. Incorporators, R. E. Beebe, W. H. Wiswell and E. F. Lawrence.

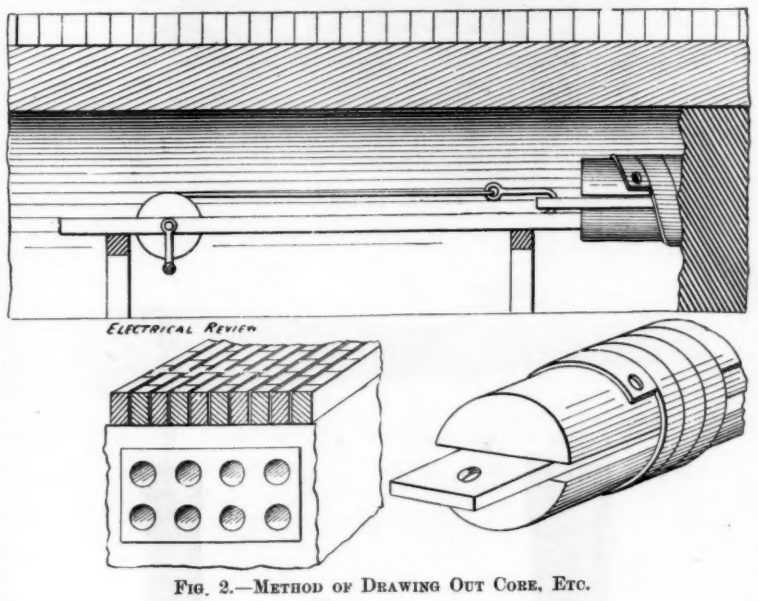


Fig. 2.—Method of Drawing Out Core, Etc.

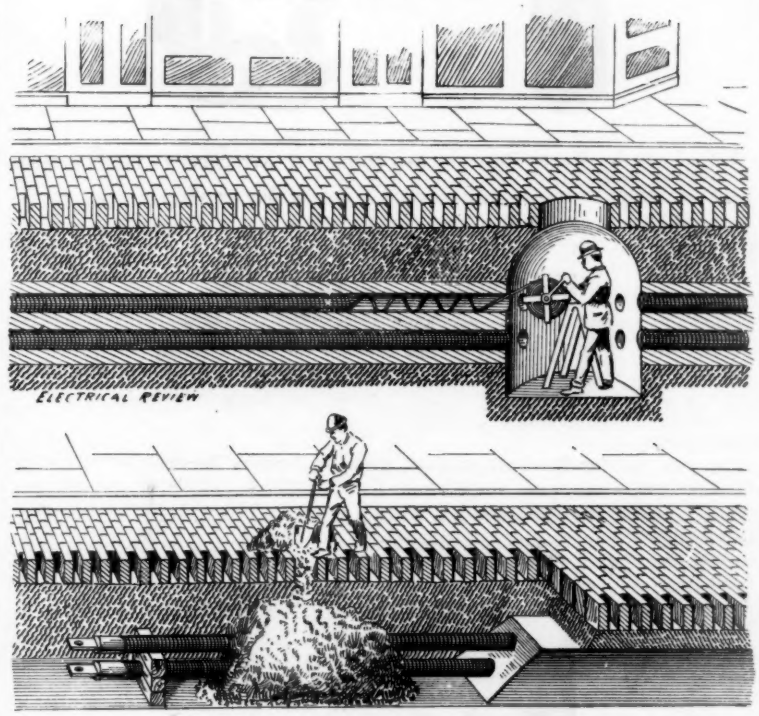


Fig. 1.—Chenoweth Conduit for Electrical Wires.

The Chenoweth Conduit for Electrical Wires.

To the Editor of Electrical Review:

The subject of sub-electrical conduits occupies much thought as one of the uppermost questions of interest, attracting the attention at once as an important subject for consideration in view of the constant demands for the application of electricity increasing daily by the addition of some new invention. Numerous obstacles must be overcome in order to arrive at a proper arrangement of the underground system of electrical wires and a perfect system of distribution.

Without dealing with the many contrivances and methods that have up to the present time been presented, I will proceed to explain a method of constructing sub-electrical conduits that recommends itself for simplicity and cheapness, securing absolute durability, is impervious to water, and is without joints, being continuous.

The requirements of a sub-electrical conduit which are about determined in the minds of our electrical engineers are:

First.—The conduits must be tubular and so arranged as to enable cables to be drawn in, old cables removed by means of manholes located at intervals along the line of conduits, from the manholes auxiliary conduits to project to houses and lamps in order to make connections.

Second.—The material used must be able to withstand the destructive effects of sewer gases, moisture, and air, frost, steam heating pipes, together with an established inductive current that is a certain cause to hasten chemical decomposition, coupled with the other conditions that are sure to be present.

Third.—The cost must be within reach of all the electrical companies, as they have expended large sums for erection of wires above ground.

Many patents have been granted for electrical conduits, and the material from which they are made is costly and destructible when brought to a test. I will not deal with each, either for comparing their merits or demerits, but will proceed to explain the method employed by the Chenoweth Conduit Company under the Chenoweth patents as illustrated in this article. The inventor, Mr. A. Crawford Chenoweth, C.E., is assistant engineer on the new Croton aqueduct, New York city.

A mixture of sand and hydraulic cement has been adopted in proportion of one cement to one of sand for an even and smooth surface for interior of conduits. As this is by far the cheapest material known, besides its permanent character under all the destructive conditions mentioned, places it first in list of materials that enter into construction of conduits. While the use of any material that can be reduced to a plastic state and afterwards hardens can be employed to construct conduits under the method about to be described.

A wooden cylindrical rod, made in lengths of 14 feet or 20 feet are cut in two, forming two-half cylinders. The spaces removed by sawing through the rods when each of the halves are placed together, is occupied by an iron rod having a thickness equal to the portion removed by saw, restoring the cylin-

drical shape. This forms the mandrel or core, shown in Fig. 2. Now a ribbon of copper ¾ of an inch wide and of a thickness equal to 24 gauge, is wound spirally around the mandrel of wood from end to end, securing the end by a screw eye to prevent from unwinding. After painting the surface of the ribbon with a thin mixture of clay and water the core is ready for use. The surface covered with a thin coating of clay prevents adhesion to cement or mixture used for structure. In Fig. 2 is shown a core for use.

A ditch having been prepared, the cores are placed side by side with one inch and a half space intervening and as many cores in the first row previously determined. The material, either concrete or any other material in a plastic state, is now placed over them, then tamped well around, bringing the level above the cores to an even surface, for another row of cores. As soon as this is done, the iron rods are withdrawn from each core by a simple device shown in Fig. 2. As the ends of the device must be brought to bear firmly against the ends of wooden mandrel, and by means of a wire cord, which is wound up on a roller by a lever, the iron rods yield quickly and are drawn out. The screw eyes having been removed from projecting spirals, the wooden halves of the mandrel drop down and are withdrawn by the hand. The spiral ribbon now maintains the cement in a plastic state, much in the same way as a center does in forming an arch. A row of other cores are now ranged with ends projecting into the spiral of the ones from which the mandrels have been removed. The ribbon of the new core is riveted to the ribbon already covered up (shown in Fig. 2), and then follows the same way of surrounding the cores with cement and removing the wooden mandrels, as previously explained. Another row of holes is projected on top of each layer, thus building up a nest. This operation is carried forward each way from a point midway between the selected places for manholes, terminating at the manholes.

When the material has set or hardened, which requires from two to three days, the spiral casing is drawn out in a manhole (shown in Fig. 1) by a simple device, which removes the twist in the ribbon and winds it up at the same time, to be used again in forming new cores. By this method we get a continuous, perfectly smooth conduit, and preserve each part of the core to be used over. The cost of constructing conduits by this method is narrowed down to the winding of the metallic ribbon around the wooden mandrels, which operation is performed by a lathe, and very quickly, at a very small cost per foot, which can be reduced to five-tenths of one cent per foot, as against an iron tube bedded in cement or a wooden tube, which are subject to destructive conditions mentioned before, and are more expensive. The manner of laying either iron or wooden tubes, or any tube, is much the same in labor as in the method described, but it must be borne in mind that in the Chenoweth conduit each part is used over, and a conduit is formed that is permanent and free from liability to clog up with iron rust or decayed or broken wooden tubes. In experimenting on cost of winding a core, the operation has been performed at a cost of five-tenths of one cent per foot for a diameter of 2½ inch core.

If an iron tube or wooden tube can be produced for this figure it would not be equal as a comparison, as they have the liability to be injured or destroyed. In conclusion, I would state a perfect monolithic conduit is secured of material whose character, in contact with moisture, gases or age, is never impaired or injured, and is continuous without joint.

By a judicious arrangement of auxiliary conduits from a manhole on line of main conduits to street sidewalk and a line of conduits under the sidewalk around the entire block, with places for connecting at every subdivision of land in order to make a house connection, a proper distribution could be made of the wires to stores, houses etc. In these, the conduits need only be a few inches below the surface and may form part of the sidewalk itself, as the sidewalks of many of our cities are made of artificial stone. By perforating them while laying, using the spiral casing, you can secure a conduit at same time.

C. E.

New York, Nov. 25, 1887.

Fig. 1—Complete Fifty Cell Barrett Battery.

Fig. 8.—Battery and Faradic Coil.

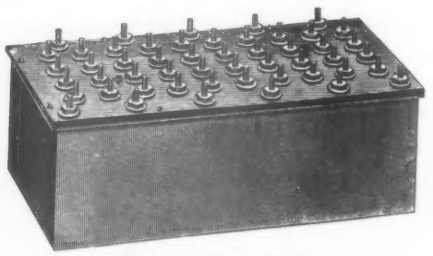


Fig 2.—Inside Case.

Fig. 9.

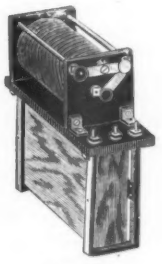


Fig. 10.

Figs. 4 and 5.—Water Rheostat and Method of Attaching to Pole Changer.

Fig. 7.—16 Cell Battery.

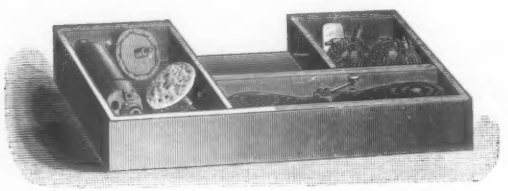


Fig. 3.—Tray of Electrodes of Barrett Battery.

Fig. 11.—Battery Closed, with Strap For Carrying.

Our London namesake says that to show how easily dust may be thrown into the eyes of the unscientific public, we mention an instance which appeared in the *Times* a few days ago. Mr. Walsh, who is interested in the "Eclipse" primary battery, states that this battery only takes three minutes to charge, whereas the Swan accumulator takes three hours, to insure a good light for the following day. Now, Mr. Walsh must know as well as we do, that accumulators are not connected up singly, and that 100 may be charged at the same time as easily as one. With 100 cells placed in circuit for three hours, this would represent a period of less than two minutes per cell. Naturally, it is necessary to have a charging plant, but here, again, Mr. Walsh is perfectly aware that electrical energy can be produced by means of a dynamo and steam engine at the pit's mouth many times cheaper than by means of his much-vaunted "Eclipse" battery, which we had hoped had ere this disappeared from this mundane sphere.

*** The Chinese telephone and telegraph grant does not seem to materialize rapidly. This is to be regretted. All the world was anxious to see how a Chinaman would succeed with the telephone.

The Barrett Chloride of Silver Battery.

The Elektron Manufacturing Company, of New York (143 Nassau street) are the sole owners and manufacturers of this improved battery, which is the result of years of careful and intelligent work on the part of the inventor, Mr. John A. Barrett. We take pleasure in presenting to our readers illustrations and description of this battery, which is now recognized as a most valuable addition to the front ranks of primary batteries for medical and general commercial purposes.

In Fig. 1 the pole changer is one designed especially for this battery, and is most simple and serviceable. The selecting plugs which fit the battery studs are attached to the pole changer by flexible conducting cords.

The inside case, shown in Fig. 2, contains the whole working portion of the battery complete and in shape for work.

The top of this case, through which the studs and wires pass, is of black rubber; the sides and bottom of the case are of ebonized wood. This case slips readily into the battery box, and can be as readily removed. When this inside case is in place, a numbered and polished black rubber top plate is laid over it, covering the nuts and washers and the lifting buttons of the case, and exposing only the connecting studs.

Fig. 7 is an illustration of a 16-cell battery. This style of battery is designed especially for private use, and to be put into the hands of patients, and is thoroughly adapted to that purpose. Any of these styles or sizes are the same as furnished to electrical engineers for standard and test batteries, with the omission of the electrodes.

The Elektron Company calls special attention to the dry cell, small size and light weight, and guaranteed efficiency. Fig. 8 is an illustration of a combined 50 cell galvanic battery complete, with a powerful Faradic coil in the same box.

The difficulties in the way of adapting this cell to this work have made it the last to be accomplished. But the Barrett "Elektron" Silver Cell will now do it. One type of this cell fitted to work the coil in the combination set is shown in Fig. 9. This cell is a compact solid block without fluid, and always ready for action. The dimensions of the single cell for the combination battery are 6 x 3 x 1. It will run the coil steadily and without attention for a great length of time, and can be slipped out and exchanged for a new cell when exhausted.

Fig. 10 shows the coil removed from its place in the battery box, and the Elektron Silver Cell in position for service. The cell remains in position during its long life. No changing or cleaning or placing of zincs is required. The coil is simple in construction and gives a smooth and powerful current instantly upon the moving of a switch lever. The compactness and absolute dryness of this cell, coupled with its steadiness of action and long life, make it what has always been desired for portable Faradic machines.

In Fig. 12 the battery contains two of the Barrett Elektron silver cells, which may be used singly or in combination. The mechanical construction of the coil is of the most perfect simplicity and completeness. The primary coil is attached rigidly by a supporting bracket to the base upon which the cells rest. This base is so fitted to the box that it is firmly secured in place by a single screw, and by turning back this screw, may be removed and inspected in every detail. The buzzer and automatic switch are specially designed for smoothness, simplicity and perfection of operation. Two distinct secondaries are provided; one of very fine wire, giving high potential, the other of heavy wire, giving a large quantity. Either of these may be used at will, and supply the means for making important distinctions in induced effects not provided for in other machines. The regulation of the current is by the well-known Dubois-Raymond plan of sliding the secondary over the fixed primary coil.

Fig. 13 shows one of the cells of the battery shown in Fig. 12. It is solid and dry. It slips into place between spring clips on the base of the coil, and is always ready for action on the turning of a switch.

Figs. 14, 15 show the Barrett Elektron silver cell put up in a shape for miscellaneous work where such cell is desirable. These cells are solid and dry. They will be furnished for the present to order only, of a capacity as required up to 6 watt-hours. These cells are in use for electric bells, working models, induction coils and telephones, and for miscellaneous electro-magnetic work.

FIG. 12.—PHYSICIANS' FARADIC BATTERY.

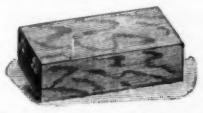
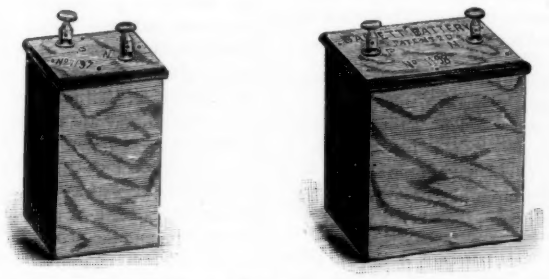


FIG. 13.—SINGLE CELL FOR PHYSICIANS' BATTERY.



FIGS. 14 AND 15.—TWO SIZES OF THE SILVER CELL.

FIG. 16.—THE UNIVERSAL HANDLE.

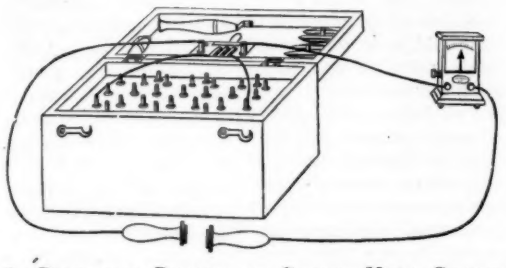


FIG. 6.—DIAGRAM OF BATTERY AND CURRENT METER CONNECTIONS.

Electric Lighting of the Paris Hippodrome.

This large building was first illumina'ed by the electric light in 1877, and since that date large additions have from time to time been made to the number of lights, and lately great improvements in the service have been made by the engineer, M. Ernest Berthier. The installation is now composed of:

	CANDLES
153 Jablochkoff candles, 4 mm. (22 carcels), equal to about	23,408
18 Gramme regulators, Type 1 (500 carcels), equal to about	72,000
1,083 incandescent lamps (1 carcel), equal to about	8,680
Total candle power, about	104,088

The machines employed are:

	REVS. PER MIN.
24 Gramme machines, ordinary type, driven at about	1,000
7 Gramme machines, for alternating currents, driven at about	850
2 Edison machines, of 110 volts and 150 amps, driven at about	1,260

Two compound condensing engines, of 100 horse power each, are used for driving the machines.

The cables are composed of seven wires of 0 009 m. each.

The actual working expenses of the electric lighting per evening (3½ hours) is calculated at:

Jablochkoff candles	38.20 francs
Levy carbons	5.25 "
Swan lamps	8.75 "
Coal	43 70 "
Greasing	19.40 "
Various items	13.50 "
Water	10.70 "
Staff	87.85 "
	227.35 francs.

In addition to this amount there is to be added on the cost of gas, which, to a certain extent, is still employed:

Gas consumption	93.00 francs.
Oil lighting	3.75 "
Staff	7.15 "
	103.90 francs.

or a total expense per evening of 331.25 francs.

Were the building completely illuminated by gas, the expenses per evening would, it is estimated, amount to 1,873 francs, calculating the consumption per hour at 1,784 cubic meters at 0.30 francs per cubic meter.

* * Scientists claim that a tide-mill located at the Bay of Fundy would generate 700,000 horse power twelve hours in a day. This, distributed electrically, and sold to every State in the Union, would save the coal supply.

Tricks of the Trade.

The average electric light man does not always drift along the stream of business success with no obstacles in his way. He cannot always walk into a new field, sell and collect and leave, without some occasional riffles and drawbacks. An agent, who called at the REVIEW office the other day, related an experience which is amusing and instructive in the business ways of Colorado and the West.

The town of M—— had decided to have an electric plant to lighten up its thoroughfares, and the council had met to consider the propositions of the two rival companies who had outstayed the others. This board of municipal authority was evenly divided between the two systems, and during the preliminary skirmishing some little feeling had already been discovered.

An alderman rose and stated that he was grieved to learn that Mr. ——, the honorable gentleman from the —th ward, had been approached by the agent of the X—— system with an insulting and criminal attempt at bribery. He went for X.'s man, as they say in the woods, "sled length," and wound up with a request that X.'s agent be arrested and jailed by the marshal. [That would help the other fellow.]

The accused asked permission to reply, and stated that the proposition to bribe the alderman referred to was made openly, after learning that his opponent, Mr. Z., of the other electric light company, had been offering to buy the votes of the honorable gentlemen. "And," he added, "the honorable gentleman from the —th ward refused the offer. It gives me pleasure, Mr. Mayor and gentlemen, to testify to the fact that there is one upright, honest man, of sterling integrity, here to-night, representing the citizens of M——." [That made capital for the other fellow.]

Then the friends of the X. company, three in number, struggled for recognition, and one after another confessed that they, too, had been approached by the Z. man, with offers of aid and consolation for their influence; and about that time a very large, fat man went out, covering the retreat of the Z. man, who marched ahead, taking that method of getting out of interrogation range, on the quiet. [That was another for the X. fellow.]

The X. man then skipped out and made his way to the city clerk's office, where he put the seal of the corporation at the lower corner of a sheet of paper, to be used in an emergency, and returned to the chamber, carelessly laying the blank document on the clerk's desk. Then came the vote. The X. fellow won. The order was made out, signed and delivered, as luck would have it, on the stamped sheet, and the agent started for the depot. [The umpire had given X. the game.]

The Z. man and his friends went for an injunction, and hung round the depot till the night train, to serve it upon an agent who never came. A horse and buggy had taken the X. man to the next station, a town some miles away. [Probably the next time it will be Z.'s turn.]

* * Some very singular electrical phenomena were observed recently, on two very dry days, at a printing office in Mainz, when the whole establishment seemed to be converted into a huge electric battery. Electric sparks several centimeters long could be drawn with the fingers from all parts of the printing machinery, just as may be done from a charged electric machine. The action of the sparks became so pronounced that the layers-on and takers-off refused to work, as burning sparks were emitted every time the machines were touched with the hands. The phenomena lasted for two days.

* * Euston station, in London, England, is lighted by a new light which is believed to possess many advantages. Ordinary coal gas, mixed in about the proportion of one to eight of common air, is supplied, under the usual gas-service pressure, to burners, over which are placed caps of platinum wire gauze. The mixture, when lighted, burns without flame around the cap, which is raised to a brilliant white heat by the combustion. The light is perfectly steady, there being no flame, and is not affected by wind or rain. More than twice as much light, it is said, is obtained, with a given consumption of gas, as by the old system. Twenty burners replace fifty if the old kind, and light a platform 900 feeton length.

ELECTRICAL REVIEW

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address

Mr. C. C. Haskins, 118 LaSalle Street, Chicago, Ill., will represent the REVIEW in the West

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NEW YORK, DECEMBER 10, 1887.

CONTENTS.

	PAGE
The Western Union Telegraph Company Ordered to pay a Tax of $10,618.46	1
The Florida Electrical Society	1
The ChenowethConduit for Electrical Wires	1, 2
The Barrett Chloride of Silver Battery	3
Electric Lighting of the Paris Hippodrome	3
Tricks of the Trade	3
Our New Orleans Letter	4, 5
More Electric Club Movements	5
A Novel Scheme to Produce a Downpour and Make the Deserts Blossom	5
Personal	5
Telephonic News	6
Telephone Investigations. By J. R. Paddock	6
Our Kansas City Letter	7
Governmental Control of the Telegraph	7
Telegraphic	7
Electrical and Scientific	8
Electricity at the Mechanics Fair at Boston	8, 9
Municipal Corporation—Grant of Privilege of Lighting City	9
The Blakey-Emmott Dynamo	9
Electric Light News	9
Electrical Patents	10

The new motor of the Elektron Company is on exhibition at 143 Nassau street, New York, where a ⅓ horse power motor is engaged in running a large job printing press. The difference in the size of the motor and the press is so great that all passers stop to investigate the striking picture presented of the motor's power. The motor is supplied direct from the Edison circuit, no lamps being in circuit.

The work on the conduits in New York having stopped for the winter, aerial electricity will remain popular until next spring.

We shall not be surprised if the phonograph shall prove the sensation of the year 1888. It will be launched early in that year.

Congress is expected to take up the question of Government telegraph this session. In this case it will be best to make haste slowly.

Whether to form an electrical association or not is still being discussed in London. In America we would have been celebrating the first anniversary by this time.

The Western Union has decided to take its Massachusetts tax suit to the United States Supreme Court. As the company is fighting the collection of a similar tax in other States, the final decision will be an important one.

Why don't some of our inventors bring out a thorough arc lamp for incandescent circuits? Many of the mills and factories have incandescent plants, but need a few large arc lights in certain places. We should think there is a field for invention here.

In response to protests against our declining certain advertisements, the REVIEW begs to once more announce that the interests of electricity and allied interests are the ones it desires to have represented in its columns. We are proud of our advertisers, and we hope always shall be.

The great West is receiving the full benefit of the erudite and versatile electric men. Recently one of them addressed the Topeka Board of Trade and so impressed them with the advantages of his motor that a committee of prominent citizens was appointed to investigate, and if the claims made were substantiated, urge upon all good citizens to patronize the electric motor. That agent deserves a medal.

It turns out that the breakdown of the large electric lighting plant of the Vienna Opera House was due solely to defective boilers, which, it is said, were overstrained by the parsimonious policy of the management in not providing sufficient carrying capacity in the main conductors. The loss in these, as alleged, was 30 per cent. It is gratifying to note that the Babcock & Wilcox boilers have been contracted for in renewal of the boiler plant, and we do not think such trouble will again occur. But the management, while at it, should renew their mains, and take "a stitch in time."

Much has been said lately on the question of lightning-rod protection for buildings. It can hardly be doubted that the lightning-rod, *when properly erected*, is a measurable protection to buildings. But the great trouble is to get them properly erected and connected. The work is entrusted to unskilled hands. It is quite a common thing to find country houses and barns fitted with rods put up in the loosest manner, and positively without any ground connections. Oftener yet, the ground is made by driving an iron bar into the ground a few feet, and binding the rod to the bar by a few twists of wire; and so it goes. Were the work thoroughly done, lightning rods would be of some service. As they are too often placed, however, they actually invite the Promethean bolt.

In response to a query as to which travels the faster, electricity or light, the scientist of the New York *Sun* says: "The French physicist, Fizean, calculated the velocity of light at 185,157 miles a second; Cornu, another Frenchman, calculated it at 185,420, and Michelson obtained 186,380 as the result of his calculations. Wheatstone, the English electrician, found that free electricity traveled 288,000 miles a second; Kirchoff concluded, from theoretical considerations, that an electric current sent through a wire in which it meets no resistance, has the velocity of 192,924 miles a second. The velocity of an electric current sent through iron wire is 62,000 miles a second; through copper wire 111,780 miles. We think justice will be done by deciding that electricity is the faster."

We had a pleasant visit this week from Mr. S. D. Nirva, M. E., of Shini Yamagimachi, Nagoya, Japan, who is making a tour among the incandescent light manufacturers of this country and Europe, on behalf of his home government, with a view to the installation there of a large central station plant.

OUR NEW ORLEANS LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

To the average citizen of the Northern United States there is a deal of satisfaction, gratification, and education in a trip through the States along the Illinois Central Railroad, to, through, and beyond New Orleans. And of all the quaint, curious and peculiar cities on the earth, this city of New Orleans beats everything in that line. The old, the new, the fresh and the mouldy are here, and the dividing line is but such a line as the geographers tell us the sun crosses at the time of the equinoxes.

There is reason in all this. Almost all the nations of the earth are represented, and no less than three governments have claimed the State, and held possession long enough to leave indelible impress upon the country and its people. The Spaniard, the Frenchman, the American, both Saxon and Norman, have mingled and are mingling to-day in one homogenous aggregation. True, there are quarters of the city where caste is apparent, but the line of demarkation—Canal street—which separates these people of many lands during the hours of darkness, is crossed during the daylight by people of every hue, from that of hard rubber to the fairest blonde.

The Capuchins of Champagne, France, in 1717, pre-empted the exclusive ecclesiastical jurisdiction over New Orleans, and in 1720 the cathedral of St. Louis was erected. Twice the structure was destroyed; once by a hurricane, and again by fire, but was once more rebuilt. It stands to day, venerable, worthy, revered and honored for its past; as a relic of the far-away by-gones, and an anchor to the hope of the faithful of now; yet only a narrow street separates it from a comparatively modern park, in the midst of which an equestrian statue of Andrew Jackson, which some of the most prominent artists of the world averred could never stand, gives the lie to their gibbering forebodings There is neither a post under the abdomen of the animal, nor is his tail tied to a stump, but old "Ly the Eternal" sits as firmly on that rearing animal, with his two front feet in the air, and as gracefully, too, as if both were living beings. The far away, the recent past and the present are here. The church, the commemoration of the sainted hero who uttered those prophetic words: "The Union · it must and shall be preserved," while the sharp rays of the electric lights that are everywhere flashing, tell of the busy present—the now of new New Orleans.

While there are perhaps more electric lights in New Orleans than are to be found elsewhere in proportion to population—an indication of a go-ahead disposition—there are other peculiarities which too plainly indicate that she is still running with one wheel in the rut. Centering on Canal street, for instance. one finds all the street cars—and there are many—but they are all of the one-horse, fare-five-cents-put-your-money-in-the-box style, such as one would expect to find in South America, or possibly in the Sandwich Islands.

It is *sui generis* in other respects. There is French spoken which a Frenchman can hardly comprehend, yet the same individual will give you as pure English as the average American, and far better than can be found in some localities at the North. The streets are often barely wide enough for two vehicles abreast, and in those which are somewhat wider, a street car track is not unusual. In other cities, red cards nailed upon houses drive passers by away. Here they attract in about the same ratio. In the one case the red card says, "Scarlet Fever"; in the other, "For Rent."

The statement having been made that New Orleans was ahead in electric lighting, even while behind in some other directions, it may be substantiated by a few figures in the shape of statistics.

There are three general companies here which do commercial lighting. These are, the Brush Company, using the Brush arc and the Westinghouse induction incandescent; the Edison; and the Louisiana Electric Light and Power Company, using the Fort Wayne Jenny Co.'s apparatus.

This last company's plant, through the kindness of Manager Hart and other officers of the company, your correspondent has been favored with a very complete inspection of, and a concise description may not be unacceptable to readers of the REVIEW.

The present site has been materially changed for the better, within the past two years, and the company, in making a swap of small for large engines, had a task on hand which was far from being child's play—for this was accomplished without shutting off a lamp. The plant, which occupies nearly the length of an entire square, consists, to commence at the bottom, of a structure which covers everything, from coal pile to leading wires which carry the current away from the dynamos. In the boiler room are fifteen batteries, consisting of five boilers each, a working force of ten, with five "spare" for emergencies. Everything about this boiler room is as neat as a pin, and arranged with special reference to the perfection of convenience. These boilers chew up about 45,000 lbs. of coal per day. The engines are Milwaukee brand—Allis-Corliss—and are three in number. One of these is rated at 800 horse power, and the other two, working upon the same shaft, with governor couplings, as one engine, are rated at 1,200. The foundation is about as near solid as it is possible to make one. There are three layers of three-inch cypress plank, laid at angles to each other. Over this a bed of concrete one and a half feet, and when this was sufficiently solidified, eleven feet of brick were placed upon it. The result is a remarkable freedom from anything like jar.

Adjoining this portion of the establishment is the dynamo room, covering a space of 177x75 feet. Two lines of shafting run the length of this room, and one on either side, and from the pulleys on these the belts lead to the dynamos. These latter are arranged so that every one of them is accessible, and yet no room is sacrificed. On this floor fifty-two Ft. W.-Jenny machines were doing the work on nineteen circuits, comprising about 350 miles of copper, and 1,200 arc lights.

Directly over the dynamo room, the company has a well-appointed machine shop, and combines with its other business the rewinding, repairing, and otherwise bettering the condition of things—and has even commenced the manufacture of dynamos on its own hook. One of these machines was doing good work on a special circuit, having been placed there originally as an experiment, and been found to materially exceed its rated capacity.

Well, the Brush people claim to be running 350 arc lights and 4,300 incandescent, while the Edison are also illuminating dark corners in very many places, to the number of several hundred lamps, so that it is perhaps not too much to say that New Orleans is as well lighted as, if not better lighted than, any city in the Union.

December, with roses in blossom, culled pussons barefooted on the street, green peas in the market, thermometer at 55 to 60 above zero, an overcoat a burden and wild birds singing their spring songs in the cemeteries—all these things make one dread to go North, where the weather is usually different at this season.

If these abominable mosquitoes will only keep quiet a few minutes more, I will hide beneath bar, and they can finish their serenade after the light is out.

As I was about to remark: There was formerly an aristocratic club here, who were patrons of the Metarie race course. Desiring to be one of them, and failing to see much difference between betting on horses and betting on cards, Mr. Rivers, who was one

of the latter, appealed to the former for recognition. He was blackballed as not a proper associate for horse gamblers, inasmuch as he was only a card gambler. So Mr. Rivers issued a mental bill of fare for the benefit of the horsey gentlemen, and he garnished the bill of fare, or programme, or horsebill, or what-not, with a plentiful sprinkling of expletives, and made the *piece de resistance* a promise to turn the horse gamblers out of the race course, and fill it with dead people. He fulfilled his promise. The Metarie race course is to-day a beautiful modern cemetery.

There has been a fierce struggle waged at New Orleans for a series of years, on the question of underground or aerial suspended wires. The arguments, pro and con, are simple in the extreme, and may be summed up almost in a breath.

Underground means out of sight, out of the way, buried.

Per contra. The opposition say there is no such thing as an insulated wire which will answer for a series of years, beneath the soil.

Overhead, properly arranged, means, says the one party, dry wire, freedom from earth contacts—and the opposition says the argument is faulty.

Between two stacks of hay the donkey starved, according to the old fable. Mr. M. J. Hart, manager of the Louisiana Electric Light and Power Company, has come to the rescue with an invention which will, to all appearances, cover all that can be required of an overhead system, and at the same time render it unnecessary to bury the wires.

Three distinct features are the subjects of patents which Mr. Hart has secured. These are:

1. Permanent wire ways for all forms of electric wires, high enough to be out of the way of everybody.

2. A method of fire escape, devoid of danger to anyone and complete in its operation.

3. A means of fighting fire from a point or points where it would be impossible to handle streams by any other process.

It is a tower system, but it is a very peculiar and carefully studied system.

The towers will be placed at the street crossings, and supporting cables, heavy enough for their purpose, will be strung from the towers, and upon these cables the various heavy wires will be suspended. At intervals between the towers, separators or spreaders will brace the supporting cables, and stand perpendicular, attached at their lower extremities to the walk or run-way which leads from tower to tower, and which is wide enough for the workmen, linemen, firemen or others to pass back and forth with as much freedom and safety as upon the earth, fifty or a hundred and fifty feet, if necessary, below them. This pathway is protected by a railing sufficiently closely put together as to utterly prevent the workmen from falling under any circumstances.

There is an arrangement for a traveling cage, so that a workman may reach any wire upon the entire span, and that far more readily than a lineman could climb a pole, or the underground man could accomplish the same result through a man-hole.

At every tower a stand pipe may be connected direct to the water supply, and this, at various points in its perpendicular, may have a coupling, or if it is better, the hose may be laid along the run-way, or coiled upon a reel to be run out in case of necessity.

This may be done by a couple of men, at a moment's warning, and much time saved through the fact that the road is clear. The crowd is on the sidewalk below, while the bewildered unfortunates whose property is being licked up by the flames—one of the most uncomfortable class of obstructionists a fire worshiper has to deal with, because both crazy and innocent, may have every thing their own way, as far as the firemen are concerned.

The city council of New Orleans, on the recommendation of the fire underwriters, has given Mr. Hart a fifty year franchise, and a company, "The New Orleans Electric Wire Tower Company," with $5[illegible]0,000 capital stock, has been organized, and has commenced operations.

The contract for the erection of these towers has been awarded as has been heretofore mentioned in the REVIEW, to the Star Iron Tower Company, of Fort Wayne, Indiana. C. C. H.

NEW ORLEANS, LA., Dec. 2, 1887.

More Electric Club Improvements.

To the Editor of Electrical Review:

I see that the New York *Herald* has given a quite full description of the electrical appliances in the New York Electric Club rooms, and this has determined me in my heretofore hesitating intention of writing up the somewhat similar conveniences of the Chicago Club rooms.

By a peculiar arrangement of circuits and influences, the invention of Frank Stewart, of the W. E. Company, the outer bell is so attached that when rung by a stranger, the proper party to introduce him is at the door, directly behind our Majordomo Joe; and the welcome conveyed in the opportune presence of an acquaintance at the outer portal is fully appreciated by the incomer.

Directly over the office desk (where this is to be) is an oval frame of happy design, which has been the subject of much remark, inasmuch as, on ordinary occasions, it contains only what seems a blank space. No sooner is the visitor's card lain upon the silver card receiver than an invisible connection is made to the frame aforesaid. The name of the visitor is instantly produced on the blank card, and at the same time an oscillating motion is given the card, just as you have seen those Ball corsets signs wobble in dry-goods store windows. At the same instant a small gong is struck, to call attention to the fact of the visitor's presence, and an instant after one of Edison's improved phonographs pronounces the name of the individual, in its own unmistakable imitation of Edison's voice. The introduction of this peculiar and novel invention is due to the combined ingenuity of Leonard, of the Edison, and Warner, of the W. E. Terry, treasurer, made a clever suggestion, which was accepted by these able joint inventors, and now, in addition to the name of the party, the hue of the complexion is indicated in the color of the card containing the name. The other day, by way of experiment, Johnson, of the Accumulator Company, and Brown, of the A. L. and P., laid their cards simultaneously upon the receiver. Instantly the annunciator card showed the names, and a medial line between these divided the pale pink hue surrounding the silver name, from the Indian-summer hue upon which the other was plainly shown in letters of richest bronze. The puzzled phonograph hesitated, and finally stammered out "John Brown." This attempt to trifle with science's highest behests is frowned upon by all, and its repetition will not be permitted.

In the dining room, surmounting the elegant sideboard is a magnificent time piece, endowed with some remarkable qualities. Of course every member of the club is numbered successively, these indicating the order in which the members are elected. Well, this clock, through the ingenuity of Will McKinlock, of the Central, and Reid, of the Mather, is very cleverly arranged so that if any member of the club should, by accident or otherwise, leave the table before paying his indebtedness, the clock will instantly ring out his number in thunder tones, and the phonograph, with the chemical register attachment, will at the same time write the name of the delinquent, while pronouncing it sufficiently loud to be heard the length of the theatrical promenade to the north of the club rooms. So far no one has pulled the string that is to prove this pudding.

Twice a week—Wednesdays and Saturdays, and on all holidays—between 12 and 2 P.M. an especial alarm is rung by this clock, when the tide of travel sets in from the east, and a music box attachment glibly trips the air of "Chippy, Get Your Hair Cut" (accompanied by the cheerful whistle of the venerable president) to the upturned faces of the passing multitude.

Badt, of the United States, has arranged the tonsorial department of the club with excellent taste and judgment, combining electricity and hair brushes, grounding one end of the circuit through a brass chain to the gas meter, while the other contact is to the water pipe, so that, on using the combs and brushes, a marked and peculiar sensation is felt, and a lasting result is experienced. The hair on several of the members' craniums, and especially on that of the learned engineer inventor, is coming out beautifully.

I haven't told you of one-half the appliances. There are automatic brushes to dust your clothes, and electrical shiners for your foot gear. A committee of inventors and scientists is now at work on an invention to run the gas meter backwards, and get a monthly credit at the gas office, while burning what gas is required, until our new electric light plant is put in.

It is stated also that in a few days we are to have an automatic arrangement at the door, or attached to each chair, by which every one entering the room or seating himself will be at once presented with an invitation to advertise in and subscribe for some electrical paper. Kreidler, Haskins and McLillie are on the work, and there seems to be some hitch in the combination—the currents don't appear to head all in one direction.

Overcoats are removed without pain by invisible influences. This is not entirely new, as something of the same sort has been seen in minstrel shows. It is, however, somewhat improved; at the show the coat was never taught to return; at the club Joe can make it come down to earth again. The improvement is his.

It is but fair to state, in this connection, that there is probably something in the air of the rooms—a remnant, as it were, of former influences, which enables us to thus readily accomplish such mysterious results. The former occupants of the premises were jugglers, and what there may have been left by them, aided by an advanced and thorough knowledge of "what is electricity?" as well as "what is an electrician?" is accountable for the rest. NUMBER TWENTY-NINE

Rooms Electric Club,
122-124 Clark street, Chicago

A Novel Scheme to Produce a Downpour and Make the Deserts Blossom.

The remarkable powers and adaptability of the electric current to the uses of society have been further demonstrated by an invention which has at least the charm of novelty. This is nothing more nor less than a patent to open the windows of heaven at the will of man, and Michael Cahill, M. D., of this city, claims the honor of the invention.

The doctor returned to town a few days ago from Washington, where he went to secure a patent and bring before the notice of the Government his strange contrivance.

"I expect to see the sagebrush deserts of Nebraska and Nevada under cultivation and affording pasturage for thousands of cattle in a few years," began the doctor. "Should the Government adopt my patent, by its use there need not be an acre of waste land on the whole continent."

"By what extraordinary means do you intend to tap the clouds and interfere with the laws of nature?" queried the reporter.

"Simply by a condenser or captive balloon and an electric cable placed wherever the rain is required. I have long believed that rain could be produced by artificial means, and I have worked at this hobby of mine for several years—ever since I left college, in fact. You see, first of all, vapor, as it ascends, receives heat from the solar rays, which also impels it upward until restricted by the cold. The vesicles, or dewdrops, being crowded together, become electrified and float on the air at an altitude of from 3,000 to 5,000 feet, and all that is required then to produce rain is to intercept these vesicles by artificial means. What I have invented is a condenser of peculiar shape and construction, and connected with the earth by an electric cable. Whenever the vesicles come into contact with the condenser or current, they are broken up and the water forced to the ground with great rapidity. The rain will be produced by the same law that causes condensation on a window pane. The surface of the glass is covered with microscopic points, and on becoming chilled, the layer of air next it falls, allowing the vapor to flow on to the points, and thence to the ground."

"You will require a gigantic balloon for such a purpose," was suggested.

"Oh, no. A condenser of about two hundred feet in diameter will bring down something like 25,000,000 gallons a day, or as much as would irrigate almost half of this State. The volume of water can be devised or formed into rivers, whichever may be desired."—*San Francisco Chronicle.*

Personal.

The friends of Mr. H. C. Davis will regret to learn of the sudden death of his father in Philadelphia last week.

Dr. H. A. Bunker, of the Electric Club, has been elected chairman of the new American party for the 22d ward, Brooklyn.

President J. F. Morrison, of the National Electric Light Association, came over from Baltimore last week to look after the interests of the Baxter motor in this field.

Mr. Chas. L. Ireson, the Boston link leather belt man, was in New York this week, personally superintending the placing of one of his belts on the Electric Club engine.

Mr. J. Hutchinson, formerly with the Edison Company, at 65 Fifth avenue, N. Y., will in the future have his office at 19 Dey street, as secretary of the Edison Machine Works of Schenectady, N. Y.

Howard Milton Linnell, the active general manager of the Hartford Dynamic Company, spent 67 minutes in New York last Saturday. His company represents the Russell engine in the East, and has found a satisfactory market for it with electric light companies.

A theatrical party composed of Electric Club members enjoyed the performance of "Henrietta" last Monday night. In the party were Mr. and Mrs. C. O. Baker, jr., Mr. and Mrs. Willard L. Candee, Mr. and Mrs. J. A. Seeley, Mr. and Mrs. Geo. T. Manson.

Hon. Chas. Selden, member of the Baltimore city council, was a New York visitor last week. Mr. Selden, it is well-known, is the head official of the extensive railway telegraph of the B. & O. Railway Company. The recent sale of the B. & O. Telegraph Company was no doubt the reason Mr. Selden received the following letter from a Kansas City telegraph man: "Your application for position as lineman placed on file Can give you position as post-hole digger about February 30, 1888."

Manager Hain's Telegraph School.

The telegraph school, established by the Manhattan Elevated Railway for the education of its subordinate employes, does not appear to be the bugbear that many imagined. When General Manager Hain organized the school it was supposed to be a clean invention of his to furnish the line with cheap operators, and it was rumored to be his intention to set these men at work at $50 as soon as they were able to handle a key, in place of the regular operators, who receive $75 per month.

Colonel Hain said that this impression was wholly fallacious.

"My purpose," he continued, "has been simply to afford the men in our employ another opportunity of promotion. Men in subordinate positions are promoted to be engineers, conductors and station agents, after satisfactory service in the company, but I have been obliged to go outside for telegraph operators. It seemed unjust to men who had proved themselves faithful in our employ to take outsiders and give them these higher berths at better pay, if it could be arranged so that the place of telegraph operator could be opened for promotion also. For this reason I have established the school, and young men under twenty four years of age in the employ of this line, if they desire it, are taught telegraphy without charge. When they become sufficiently proficient they will be eligible to promotion, but there is no thought of setting them to work at reduced wages, as has been foolishly asserted by people who do not know what they are talking about, and who would be much better employed if they attended to their own business."

The Electrical Supply Co. of this city send out the following circular:

"As soon as the present stock of merchandise now carried in our New York store is disposed of, we shall discontinue carrying a stock here. Thereafter, in place of carrying a partial stock in New York and a partial stock in Ansonia, we shall endeavor to carry a full assortment of goods of our manufacture at our warehouse in Ansonia. We shall continue our New York office, and have same connected with Ansonia by telephone. This will enable us to order goods from Ansonia as late as 5 P. M., and the same will be delivered in New York the following morning.

"We shall also continue carrying a full line of our goods in our Chicago store as heretofore. Yours truly,

THE ELECTRICAL SUPPLY CO."

Telephonic News

⁂ Still the telephone subscriber is coming in. Nearly all the companies report increasing lists.

⁂ It will probably be six months yet before all the improvements decided upon for the new exchange of the Metropolitan Company on Cortlandt street will be completed.

⁂ On Wednesday of this week the investigation by the legislative committee into the telephone business of this State again commenced, and will continue for several days.

⁂ A number of handsome and energetic telephone men were in New York last week, visitors at the Electric Club. Among these were A. B. Uline, W. N. Estabrook, W. D. Sargent.

⁂ That very successful telephone company on the Pacific coast, The Sunset, with Jno. I. Sabin as general manager, has issued its November list of subscribers, gotten up with extreme care, not a line of advertising appearing in it.

⁂ Col. D. B. Parker, although at the head of the Superheated Steam Company, with headquarters at No. 44 Broadway, N. Y., has not lost his interest in telephone matters, and is still one of the best posted and most level-headed men in the business.

⁂ A man in Lowell, Mass., has lately been arrested, charged with the novel crime of stealing large quantities of electricity from the local telephone exchange. He has tapped the wires of the telephone company and is said to have tampered with the company's meter. In addition to these rascalities, he has also been running a private telephone exchange with several subscribers. The next steal we hear of will be stealing lightning from some thunder storm. It would be well for some of the officials engaged in railway and other steals to make this gentleman a member of their organization.

⁂ A correspondent at Niagara Falls says that Buffalo capitalists were talking of becoming interested in the Falls tunnel scheme, and had in mind to bring electric power to Buffalo, to turn the spindles in our factories. Who these interested Buffalonians are does not yet appear. A reporter who investigated was only able to learn that the agent of the tunnel enterprise was in Buffalo three or four months ago, but after a deal of figuring was not able to show the interested parties that he could transmit power except at an enormous cost for the plant, the bill for wire alone running up into the millions for the amount of power that would be needed. He figured that the cost of wire to transmit 100 horse power would be $100 per mile, or $2,000 for a single 100 horse power delivered in Buffalo. That would hardly do, so thought the interested capitalists.

⁂ General Manager C. A. Nicholson, of the Central New York Telephone and Telegraph Company, has been a very busy man of late. The occasion of the press of business was the preparations for carrying out plans for extensive improvements in the telephone service of the city of Utica.

In the first place the company will go into new quarters. An apartment has been rented on the second floor of the Munson building for a term of ten years. Here the central office will be located. The attic of the building will be occupied by the cable terminals and distributing apparatus. The batteries will also be stored there. The exchange will be equipped with the most modern multiple boards, each having receiving capacity for 1,500 subscribers. The present system can accommodate about 600. The new boards will be an improvement in some respects on those recently put into the Syracuse exchange, which was the latest until that to be used in the new Utica exchange.

Telephone Investigations.

By J. R. Paddock.

The following investigations were suggested to my mind from observing the marked advantage gained in modern telephone transmitters by the use of granulated carbon It occurred to me to try the effect of the same and other powders in the Reis instrument, particularly in the cubical box transmitter, as the latest commercial instrument has returned in many of the details of its construction to this form of a transmitter, viz. : to a platinum diaphragm placed horizontally, with the other electrode suspended above it, and the intermediate space filled with granulated carbon.

My first experiment was to place a quantity of granulated carbon (made by drilling out carbon battery plates) upon the platinum patch of the Reis instrument, and the result was in accordance with my expectation. It transmitted speech under these circumstances clearly and distinctly. I next reduced the quantity of carbon dust or grains on the diaphragm and found the result quite as good as before. I then removed all but a few grains between the electrodes. Still the instrument operated as a good transmitter. After a little time, however, these grains of carbon were scattered and had to be renewed.

I then prepared granulated platinum by drilling out pieces of platinum foil, and placed this granulated platinum upon the platinum patch of the diaphragm. The result was a harsh, grating quality of sound Tried black lead dust from lead pencil (A. W. Faber's No. 4) with much better results The quality of the speech transmitted at once became smooth and at the same time more distinct. Recalling the experiments of Mr. Edison with lampblack, I prepared some soot deposited at low temperature from a smoking kerosene lamp, and placed a few grains of this upon the platinum patch. The results were very satisfactory, and the quality and loudness of the speech transmitted surpassed all previous results.

I next obtained finely divided platinum, (known as platinum sponge) from H. M. Raynor, 25 Bond street, New York. Also, soft and well annealed platinum foil from Baker & Co., and dioxide of lead, iodide of copper, and a 10 per cent. solution of bichloride of platinum, together with pure charcoal made from willow wood. The charcoal was heated to redness and plunged into the solution of bichloride of platinum and afterwards pulverized, thus forming with the others a new series of metallic powders for trial.

I first tried the platinum sponge, which gave results that were not satisfactory. The sounds were harsh and grating. I next tried the charcoal impregnated with platinum, which gave better results, the sounds becoming more agreeable to the ear. The iodide of copper was equally good, but soon disintegrated under the action of the current. The dioxide of lead was then tried, and found to surpass all the other powders of this series, giving admirable results. The articulate speech transmitted by means of it was clear, distinct and loud —and its efficiency closely approximated to that of carbon or lampblack. I next tried the following mixtures of powders: Platinum and lead, platinum and carbon, iron and carbon, each in equal parts. The results were not as satisfactory as when used alone. The addition of oil or syrups improved their action slightly.

Having noticed that the diaphragm when in vibration, soon scattered the grains of powder, I made a cavity in the center of the platinum patch, and placed the powder within it; but the volume of sound from the receiver was reduced one-half thereby, and the deeper the point of the hammer electrode was immersed in the powder, the fainter the sounds became. Returning to a shallow indentation in the platinum patch, the sounds became louder. This was owing to the fact that the sides of the cavity offered comparatively free passage for the electric current; and I therefore constructed rings of non-conducting material, which, when placed on the platinum patch, overcame that difficulty and at the same time kept the powder from being scattered. The results obtained thereafter were entirely satisfactory.

The next step was to ascertain, if possible, what was the principal agent in the variation of resistance by means of these powders. Whether it was the loose contacts of the grains of powder among themselves, or the surface resistance of the powder upon the electrodes, or both combined. After many trials, it was found that when the upper electrode was fixed so as not to be capable of movement itself, no sound proceeded from the receiver, notwithstanding that the particles of powder surrounding it were in constant agitation, and the intimacy of their contacts among themselves continually changing, under the action of the voice; and again, the upper electrode being removed, a piece of platinum wire, suitably connected to the binding post, was held in the hand, with one end dipping into the powder. In this way, by varying the rigidity with which the platinum wire was held, the instrument could be made to transmit speech or not at pleasure; and it was found again that the upper electrode required to be free to move up and down on the surface of the powder, in order to obtain sounds in the receiver—which pointed to the surface contact of the upper electrode with the powder as the place where the principal variation of the electric current takes place, and tended to show that all other variation was exceedingly small in comparison. Still it appeared reasonable that the violent agitation of all these loose particles would aid somewhat in producing the final result.

Cause of the Efficiency of Powders in Telephone Transmitters.

In order to throw additional light upon the subject, I have endeavored to ascertain the range of variation in resistance due to surface contact and pressure when powders of this kind are introduced into an electric circuit, and for this purpose constructed an apparatus consisting of a glass tube, one centimeter in diameter, to which was fitted a mixed metallic base and movable rod or plunger (brass). This rod was moved by means of a micrometer screw, with 32 threads to the inch, the head of the screw being divided into 360 degrees. It was suspended by spiral springs, against the tension of which the screw moved.

The minimum measurement of the screw was $\frac{1}{11520}$th of an inch, but the error of the apparatus was so great that measurements were taken with 10 degrees at a time, giving $\frac{1}{1152}$nd of an inch, compared with which the error would be perhaps one per cent. The whole was suitably fixed in a solid framework, and the metallic base-piece and rod connected to binding posts, thus forming the electrodes of the circuit.

The space between these electrodes to the depth of one centimeter was filled with the powder to be examined. Each powder by this means formed a cylinder one centimeter in diameter, and one centimeter in length. These dimensions were chosen as furnishing a basis for the estimation of the resistance of a unit cube, or the specific resistances of these substances, provided the measurements proved of sufficient value.

The micrometer screw was first turned down to what I may call the zero line for each experiment, which line was always taken just below the contact surface, so as to give each powder an equal compression of its mass, and also to render its surface conformable to that of the electrodes. After this, the screw was reversed and the upper electrode raised. The measurements of resistance were then taken by means of the bridge method and with a mirror galvanometer.

Heat Effects in Telephone Operations.

Some years ago I accidentally discovered, what was then new to myself, that microphone transmitters would also act as receivers, and subsequently that any loose contact in an electric circuit would reproduce sounds made at a telephone transmitter. That the heating effect of the current at the joint should have something to do with the reproduction of these sounds has always appeared probable, provided that the variations of heat were sufficiently rapid to coincide with those of the current. That such heat changes are sufficiently rapid in lampblack, for instance, to reproduce musical and articulate sounds, is demonstrated by the well-known experiments with a beam of intermitted radiant heat (Tyndall's exp.), and still more recently the "thermal telephone" has shown the same to be true for a fine metallic wire heated by means of the electric current. (Chas. R. Cross, 1885).

In the case of a loose contact surface, therefore, we may consider whether this heat effect is the same or in an opposite phase to that of the varying strength of the current passing through the joint. In the case of metals, the temperature coefficient being positive, resistance increases with the strength of the current; but in the case of carbon, whose temperature coefficient is negative, resistance decreases with the strength of the current.

In order to ascertain how important a factor heat might become at a light contact surface, I undertook the following experiments:

The powders whose resistances had been measured for contact and pressure were now measured for changes in temperature. In order to do this, the apparatus before described was immersed in a bath of water at the temperature of 25° centigrade, and the screw having been brought down to a zero line chosen with reference to light contact, the resistance was measured for each substance by the bridge method as before.

Table Showing Variation in Electrical Resistance for Temperature.

In cylinder one centimeter in length and diameter.

Temperature in Centigrade Degrees.	Carbon Powdered.	Peroxide Lead Powdered.	Peroxide Manganese Powdered.
	Ohms.	Ohms.	Ohms.
25°	2,000	2,750	5,520
26°	1,912	2,409	5,200
27°	1,811	2,061	5,000
28°	1,609	1,803	4,707
29°	1,459	1,586	4,450
30°	1,375	1,375	4,229
31°	1,237	1,100	4,070
32°	1,143	726	4,017
33°	1,054	575	3,960
34°	1,000	485	3,900
35°	910	408	3,838
36°	863	304	3,785
37°	807	255	3,762
38°	732	225	3,731
39°	695	208	3,687
40°	657	200	3,644
41°	621	191	3,600
42°	578	184	3,573
43°	530	176	3,545
44°	470	167	3,519
45°	No change.	162	3,498
46°	No change.	158	3,485
47°	Sudden change.	150	3,473
48°	185	145	3,461
49°	152	140	3,449
50°	112	136	3,438
51°	71	133	3,431
52°	42	130	3,425
53°	21	127	3,418
54°	18	124	3,412
55°	15	121	3,406

The temperature of the bath was then raised one degree at a time, and the resistance measured for each degree of temperature from 25° to 55° Centigrade. Observations were taken at intervals of 10 to 15 minutes apart. The table above gives the results, and it will be observed that carbon (powdered) fell from a resistance of 2,000 ohms to 15 ohms, and peroxide of lead from 2,750 ohms to 121 ohms for 30° of temperature; that is, in being heated from 25° to 55° Centigrade. By reference to the first few degrees of temperature, the exceedingly rapid fall of resistance shows how powerful a factor in variation of resistance heat may become in cases of light contact.

It is also seen at a glance that both the oxides of lead and manganese have like carbon negative heat coefficients.

In order to ascertain the presence of thermo-electric currents, the battery was disconnected and the heat experiments were repeated, but such currents were very slight indeed, scarcely noticeable. The polarization or "storage" effect, however, was greater, and in the case of peroxide of lead a return current was quite marked after each experiment.

These experiments are intended to form a basis for further investigation in the future. So far as carried they open an interesting field for study, and furnish suggestions for a better solution of the telephonic problem.—*London Electrical Review.*

OUR KANSAS CITY LETTER.

(From a Special Correspondent of the ELECTRICAL REVIEW.)

The telephone service is still being commented on by the press. The *Journal* appeared the other day with nearly a column of interviews with citizens, in which the service was generally condemned. The *Journal* backed up the denunciatory remarks editorially. The same day, the *Star* appeared with an article claiming to give the facts in the case in an impartial manner. A *Star* reporter had visited the exchange without notice, and had investigated the "service" question for himself. His verdict was that, as a rule, the service could not be bettered; that in nine cases out of ten, when a patron sent in a complaint, he should have sent in a compliment, and that if there was occasionally bad service, it was because "man was mortal and prone to err."

Two-thirds of the cities in Kansas that are using electric lights, are using the Thomson-Houston system, among which are Fort Scott, Manhattan, Council Grove, Parsons, Salina, Oswego, Larned and Dodge City, and all are perfectly satisfied with them.

A meeting of the directors of the Salina, Kansas, Electric Light and Power Company was held last week, and the following named gentlemen were elected: president, J. F. Burrows; vice-president, George Kreuger; secretary, W. R. Geis; treasurer, W. G. Gilbert. The company made a contract with the Archer Manufacturing Company, of Wichita, for an electric plant, and also let the contract for the new building to W. F. Gilbert, who is now at work on the foundation. The building will be of brick, with a frontage of 25 feet, and a depth of 100 feet, and of one story, 16 feet in height; St. Louis pressed brick, colored front glass windows, galvanized iron cornices and slate roofing will be used. The dynamo room, engine room, etc., will be finished throughout with hard pine. Mr. Geis, who will likely be chosen superintendent, says the citizens have subscribed liberally for lights, and that the company will show its gratitude for this by erecting a plant of which the citizens will not be ashamed. The capital of the company is $25,000.

The electric light company of Independence, Mo., held a meeting last week, at which it was decided that if the city or the business men paid for the lights which the company had been furnishing along the main streets and around the public square, they would be discontinued.

The Kansas City Electric Railroad Company has increased its capital stock to $50,000, with the determination to establish a better system of electric railways in Kansas City. Mr. W. E. Winner, who is largely interested in the road, said: "The principal reason for increasing the stock of the company is to establish, in connection with the road, an electric light plant. We have the right to furnish lights through the city, and as Kansas City can well support another good institution, we will at once become established. There are several good lights that can be secured; the Jenney or the United States, for instance. The electric road will also receive a benefit from the increased stock. New cars will be added to the now small outfit, and it is probable that the Guinotte extension will be made."

The electric railway company, of Lincoln, Neb., is short of material, and cannot proceed with track laying until timber arrives. Nearly one hundred men were laid off last week on this account.

The engine and dynamos of the electric light plant at Wichita, Kansas, were tampered with Tuesday night and one of the dynamos probably ruined.

The latest in street railway news from Omaha, Neb., is that storage batteries instead of an overhead electric wire will be used on the motor railway when it begins operations next spring. Construction has been stopped for this season. The power house on Fourteenth street, near Cbicago street, is under way, and the boilers have been received. About ten miles of road have been built this year, and $100,000 expended.

"When do you expect to begin work on your electric light plant?" was asked of Mr. Benjamin Freidberg, who was recently granted a franchise by the city council of Kansas City, Kansas. "We can do nothing with the matter until spring," replied Mr. Freidberg. "When we first introduced our petition in the council, it was thought that the franchise would go through in a few days, and we could put up our plant this fall. It is too late, however. It will cost $25 000 to place everything in working order, and we expect to commence early in the spring. The people of the consolidated city need an electric light system, and we expect to give it to them as soon as possible." MURPHY.

KANSAS CITY, MO., Nov. 29, 1887.

Governmental Control of the Telegraph.

The absorption of the Baltimore and Ohio Telegraph Company by the Western Union will probably bring the question of government control of the telegraph again before the public. What, then, are the general principles involved? What are the arguments both for and against State interference?

In the first place, the telegraph business, like the other great industries of transportation, is of a semi-public nature. The daily news is transmitted by telegraph. Market reports of all kinds, as well as the record of transactions in the Exchanges, are published by it through the country. The telegraph is a great artery of communication between man and man. With its activity the largest interests are involved, public as well as private.

This being true, it clearly follows that the question before us is not one of right, but of expediency. It is now generally conceded that the national government has the power under the constitution to assume control of the telegraph, if it chooses. The discussion, then, must be confined to this: Can the government, as at present constituted, do the work involved better than a private corporation which has monopolized the business, and which conducts it with a view to profit? Should the telegraph system of this country be a State monopoly or a private monopoly?

The supporters of the present system affirm with truth that the Western Union conducts its business with a high degree of efficiency. Its messages are delivered with great promptness and accuracy. It probably serves the commercial public as well as any postal telegraph system in Europe. The volume of business done over the lines of the Western Union is much greater than that done in any of the continental countries. Such efficiency of course could not be attained unless its service, both as to *personnel* and as to instruments and wire in use, were of a high order of excellence. There would be little room for improvement in these respects if the government should assume control of the business.

It is also claimed that the Western Union has extended its lines over the remoter parts of the country as rapidly as it is possible for a private corporation to extend them. It has endeavored to meet each growing demand for communication whenever and wherever it has arisen. At the same time the Western Union has largely reduced the average of its charges as the amount of its business has increased. In 1869 it cost $3.25 to send a telegram from New York to New Orleans. In 1884 the same telegram could be sent for 75 cents, and now it costs 60 cents.

Finally, it is urged, with much reason, that the nature and present condition of our government and the character of our people are unfavorable to any large extension of State power. We live under a system of party government. The civil service is imperfectly developed, and is still, to a great extent, under the influence of partisan politics. Therefore, private interests of the worst kind would probably influence the administration of the telegraph, if it passed under the control of the government. The sphere of political corruption would be enlarged.

On the other hand, the supporters of State control refer us to the successful experience of Europe. There the telegraph business is carried on exclusively by the governments, except in the Netherlands, where it is partly under private control. In Europe the telegraph business is carried on as a branch of the postal system. The post-offices are used also as telegraph offices, and, except in the larger towns, the same corps of officials performs the work of both.

Under this system a net-work of telegraph lines is extended throughout the entire country. As compared with the best private system, a large increase of the number of offices is made both in the cities and in the sparsely populated districts. This change has been wrought in England since the government bought out the private companies. In this country we have seen similar results produced under a national administration of the post-office. The reason for it is that public convenience rather than profit is sought. Still it is true that postal telegraph systems usually yield a net revenue to the government.

Another advantage is the lowering of rates. This suggests a charge made against the Western Union, which its friends have failed successfully to meet. Its stock has been watered by the issue of large stock dividends till it has reached an enormous sum. Its nominal capital is at least three times the cost of its plant. This makes it possible for the company to maintain high rates, and yet to appear to pay only reasonable dividends. If competing lines could be run successfully, this might be prevented; but it can never be done. History proves that such enterprises are destined to be absorbed by their great rival after a short struggle for existence. The rates charged by the Western Union are monopoly, and not competitive rates. They are much higher than the prices charged for equivalent work in Europe. According to the best estimates, we pay about twice as much to send telegraphic messages as is paid in England. The difference between our rates for telegrams and those paid on the continent of Europe is still greater. Also local and personal discriminations prevail here, but do not exist there. One important result of this is that the telegraph is used much less generally in this country than it is in Europe. Here, its business is nearly all commercial; there, it is largely social as well.

Viewing the subject from the social standpoint, the building of competing lines involves a serious waste of capital, which can be prevented by the establishment of a government monopoly.

In spite of many points of excellence in the present system, it must be admitted that a strong indictment has been presented against it. It fails in several ways to render the best possible service to the whole community. The outcry against private monopoly in this case is largely justified from the history of the concern. Its past record will not bear honest scrutiny. It is capable of becoming the source of political corruption. Would the evils be increased should the government buy out the Western Union Company at a fair price, and add perhaps 20,000 officials to the present number of government employes? If we had a civil service organized and administered according to scientific principles, the answer would not be difficult. As it is, the situation furnishes an argument in favor of a thoroughgoing reform of the civil service, so that, if it should become necessary, the government may be able to assume new functions. HERBERT L. OSGOOD.

There are twenty-seven telephone subscribers at Ottawa, Kansas; but thirteen more are needed to make it paying. J. O. Stockwell, of Burlington, Kansas, is manager, and N. E. White, assistant. The exchanges have connection with Kansas City, St. Joseph, Atchison, Lawrence, Leavenworth, Topeka, Paola, Olathe, Osage City, and other smaller places. The fire department has asked permission to string the fire-alarm wires on the poles, but Superintendent Smith, who has the matter in hand, has not yet decided what he will do.

The Herrington (Kansas) Electric Light and Water Works Company has been incorporated in Kansas. The capital stock is $12,000. J. W. Creech is president.

W. C. Powers, of Newton, Kansas, had the electric light service put in his fine building on Main street last week. Arc lights were put in both the first and second stories, and his fine furniture establishment will show off its beauty at night as well as in the day.

The Concordia (Kansas) Telephone Exchange contemplates running a line to Clyde, Jamestown, Glasco, Miltonvale and Belleville, just as soon as they get the Concordia exchange in good working order, which will be done in about three weeks.

The electric light blockade at Wellington, Kansas, has terminated by the city contracting for five arc lights, at $120 each, for one year only. Heretofore the citizens have been keeping the lights going by means of private subscriptions.

TELEGRAPHIC

.... The getting ready for burying wires in New York will now take a rest until next spring.

.... The telegraph operators, it seems, were not very badly left by the recent consolidation; nearly all of them have secured positions, chiefly with the Western Union Company.

.... Col. R. C. Clowry, one of the best men connected with the Western Union in high official capacity, is personally overseeing the improvements now being made to the service in California.

.... The telegraph was introduced in Japan about fifteen years ago, and now the islands are well strung with wires and connected with each other by cables. The operators are wholly native born, and in order to keep up the supply and meet the wants of the future, a school has been established for the instruction of operators.

.... A petition has been filed with the Secretary of State, Massachusetts, for presentation to the Legislature, signed by Chester Snow and others, for the incorporation of the Postal Automatic Telegraph Company. The company propose building a telegraph line across the continent, from New York to San Francisco. The company is to be incorporated with a capital stock of $3,000,000 and authority to increase the same to $20,000,000.

.... A resistance regulator for electric currents has been patented by Mr. Georg Montanus, of Frankfort-on-the-Main, Germany. The invention consists of a number of wires forming a rheostat, and connecting a number of springs with the terminals of the motor, and of a ring having a segmental flange, which, when turned, connects the first flange, of the number of wires with any desired number of the remaining wires, being especially adapted for electrical dental motors.

.... The Western Union Telegraph Company announces the following reduction in telegraph taking effect December 1st:

1. The maximum rate east of and including Montana, Utah, New Mexico and Texas will be reduced from $1 to 75 cents.

2. Within the section east of the Mississippi River and north of Tennessee and North Carolina the maximum rate will be reduced from 75 to 50 cents.

3. Within the section south and including Virginia and Tennessee and east of the Mississippi River the maximum rate will be reduced from 60 to 50 cents.

.....The Western Union is ordered by the United States Circuit Court at Boston to pay at once the taxes of 1885 sued for by the State of Massachusetts.

The *N. Y. Sun* says that the case is only two years old. Decrees in suits begun many long years before are still outstanding, and apparently no nearer final settlement than when the first judgments were obtained, away back in the misty past.

In this particular instance, in anticipation of the customary delays, a clause has been inserted in the judgment of the court inflicting a penalty of 12 per cent. on the principal sum from the time the tax was due, if payment be not made within thirty days.

The defendant, of course, expects to escape in some way the decree of the court, but every day's delay simply adds to the original heavy burden.

What the Western Union is going to do about it is a question, the answer to which is looked for with absorbing interest in every State of the Union.

* * The efforts of the telephone company of Austria to get the Bell patent canceled, have, it seems, at last been successful. Their manager, Mr. R. Howard Krause, believed this possible from the commencement, and with the assistance of Mr. Otto Schaffler, the company has been the means of securing free trade in telephones in Austria. The result of the decision of the Austrian Ministry of Commerce, and the Hungarian Ministry of Agriculture, Industry and Trade, dated October 28, 1887, seems to be that all those clauses of Bell's patent which refer to the telephone are canceled, only those referring to the multiplex telegraphy being allowed to stand. Certain clauses were canceled because the telephone company of Austria were able to prove prior publication, and others were canceled because the company proved that they embodied scientific principles which, according to Austrian law, cannot be the proper subject of a patent.

* * *Nature* describes a new way of utilizing dynamite, lately devised by Mr. Bonnetond, a French military engineer, who uses the expansive force to drive out, for a brief period, the water from portions of wet ground in which foundations are to be made. The method is now in practice in the construction of a fortified *enceinte* at Lyons. A hole is first bored 10 feet or 12 feet deep, and about 1½ inches wide, in the wet ground. Into this is passed a string or cartridges of dynamite, which is then exploded. The water is thus driven far out beyond the sides of the cavity, over a yard wide, which is produced, and it does not reappear till after half an hour at least. The workmen thus have time to clear the cavity and introduce quickly-setting concrete. When the water returns, it cannot injure the foundation. A rapid rate of progress is realized by this method.

* * Charles G. Curtis and Francis B. Crocker, two electricians, have for a year or more been giving their attention to the problem of aerial navigation. They believe they have perfected an electrical contrivance that will enable them to control the direction of a captive balloon in motion. The new flying machine is yet only a theory, but it will soon be put to a practical test. Many of the details, although fully worked out, cannot be made public, as the inventors have not yet completed their patents.

Mr. Crocker, however, did not hesitate to give a general description of the new machine last week. He declared it the most simple of any that has so far been proposed. The motive power and steering apparatus consist of a fan from five to ten feet in diameter, with a wide blade of thin steel. The fan is to work horizontally, deriving its power from an electric motor suspended just below the center or hub of the lowest side wheel. Below the motor and fan the car will be suspended. The motor is to weigh not more than 200 pounds, and will have the force of a ten horse power engine.

The fan will ordinarily make 1,500 revolutions per minute, but can be increased to 3,000 or even 5,000 revolutions in case of an emergency. The steel blade, acting against the air at such speed, will be sufficient to carry the machine upward and to steer it with or against a current of air by deflections of the fan.

The new flying machine is not, however, a free agent to fly like a bird where it listeth, but must remain captive, connected by wire with a dynamo, which will furnish power to the motor. Up to the present time no storage system or primary battery has been discovered of sufficient power or lightness to be carried by the machine itself. Mr. Crocker is deeply interested in his invention, but he admits that it will be of no practical utility, except for war purposes or weather observations. He hopes to have the machine perfected in time for exhibition at the Paris exposition.

Electricity at the Mechanics' Fair at Boston.

The Massachusetts Charitable Mechanics Association is one of the oldest organizations of the kind in the country, dating back to the British rule, and still continues to perform the work in the advancement of mechanical skill and the interest of artisans. Their sixteenth exhibition is held in their enormous building, which was erected in 1881, although the first movement to secure a building for the ownership and uses of the association was inaugurated in 1798 by Paul Revere, known in history for his famous ride warning his countrymen of the departure of the British soldiery for the march which resulted in the battles at Concord and Lexington,

> "Where the embattled farmers stood,
> And fired the shot heard round the world."

But now all is peace; and patriotism is shown in limiting the awards to American products.

The electrical exhibits are varied and instructive, of a high average in design and skill, but lacking, perhaps, any new strokes of inventive genius, such as startle a generation into new paths.

Electric lighting naturally attracts the first attention, from its prominence as well as the excellent representation here presented. The Edison Company have a large plant, for exhibition only, which lights the art galleries and a large portion of one section of the building.

The Mather Electric Company have a fine incandescent plant, one dynamo acting as a motor, and another one as a generator furnishing the current to the motors in another exhibit.

The Waterhouse arc-lighting system is evidently new to most of those who examine its novel method of regulation by dividing the return current, sending a portion through the field magnet coils, and the remainder into the armature through the third brush, which appears a superfluity until its important use is explained. The manager, Mr. G. W. Adams, showed the operation of the regulator by switching lamps in and out of circuit, and also short-circuiting the dynamo with a piece of copper between the binding posts. A novelty of this system is the use of the repulsive force of the electro-magnets instead of the attractive force; this is for the purpose of utilizing the motion of the armature through a longer space than would be possible with magnets using unlike polarities in the usual manner. Their ammeter, based on this principle, without the use of any springs or complicated mechanism, is a very useful instrument.

The Ball Electric Light shows a number of their new 800 candle power lamps, using a current of four amperes. For interior illumination these lamps have evidently a great many applications where they fill a need of just such a lamp.

The Tremont Electric Company have an exhibit in which their very efficient machine appears to good advantage. It will be remembered that the magnets are partially of cast iron, and of coiled sheet iron under the field coils.

Kimball & Co. have a number of dynamos, one of them generating the current for two 5-candle power incandescent lamps in a chandelier. The incandescent lights connected to these dynamos are made by the Stella Company and show a high degree of incandescence.

Other lamp exhibits are those of the Diamond Electric Company, which shows arc lamps of 300 candle power, using very small carbon rods, and which, in softness and purity of light, reminds one of the Werdermann semi-incandescent light, which was never but little used in this country.

E. & F. Heymann exhibit a disk arc light with the arc between a pair of horizontal carbon disks revolving in opposite directions and hung below the lamp.

In electro-motors the largest exhibit is that of Sprague, which contains about half a dozen in various parts of the building, running printing presses, textile machinery, etc., including a self-acting bustle large enough for a tournure to a sugar hogshead and placed in the gallery.

Formerly this bustle was operated by a boy behind the screen, like the usual perpetual motion machine, and similarly also the boy would tire, and therefore his services were replaced by the motor.

The Whittier Machine Company exhibit their hydro-electric elevator, which is in practical use lifting spectators. It is their ordinary piston elevator, with a head of pressure furnished from a closed tank. A Daft motor keeps up the pressure in this tank by operating a pair of power pumps, whenever it is reduced below the standard. The elevator can also be handled by electricity by means of push buttons, instead of the ordinary rope.

The Enos suspended railway, similar to the one at St. Paul, is shown by a large working model; and also the Erhardt railway is exhibited, its peculiar features being devices which have been used for the maintenance of continuous electric contact and better modes of applying the electric force to the tracks.

The American Conduit and Construction Company exhibit the only matter connected with the forthcoming problem of underground wires. Their system comprises a cellular conduit similar in form to that of the Dorsett used elsewhere, but made of an artificial stone, which appears to be durable, hard, and with sharp edges.

There are half a dozen exhibits of electrical supplies and apparatus, in all of which the workmanship is of a high quality, and in competing lines each of the several exhibitors has some characteristics of peculiar merit.

The Boston Electric Company show a very large and comprehensive exhibit containing a wide variety of electric supplies, in all of which the workmanship is of a noticeably superior quality. The electric gas-lighting apparatus, applicable to a wide range of burners, automatic burglar alarms, and fire alarms in connection with gas-lighting and annunciators, and also the gas-lighting apparatus for fire departments, so arranged that the first stroke of the fire alarm ignites every gas jet in the building. This is done by placing a relay in the closed circuit of the fire alarm, and when it is broken the release of the armature throws the local circuit through each gas-lighter in the building. This device does not interfere with the lighting of the gas by the ordinary knob, or bell, or even with the match. This device, as is well known, is applied in connection with the Gamewell fire alarm in most of the Eastern cities.

The exhibit also contains a large assortment of bells, batteries, and watchman's electric clocks, and also instruments of electrical measurement.

Fuller, Holtzer & Co. show a very creditable display of electrical supplies for telegraphy, signaling, and electric light installation. They have an extended line of electric light ers and hotel annunciators, also electric wind indicators, anemometers, frictional gas lighters, and watchman's electric clocks of improved construction, containing appliances for the purpose of aiding convenience in placing or removing record sheets.

Beckford & Fuller have a large exhibit of annunciators and bells, including a pneumatic system, which although extensively introduced in New York, we find to be rather new to Boston friends.

The Electric Gas Lighting Company present a display of gas lighting apparatus and other electric supplies, among which may be mentioned a gas lighting apparatus by which the height of the jet can be regulated at will on a push of the button, instead of being compelled to use the full flame or none at all. In this exhibit is a watchman's electric clock, an ingenious construction, and quite different from any others that we have seen. Also an electrical mail box, which announces whenever anything is left by the letter carrier.

A. L. Russell, the successor of Charles Williams, jr., known for so many years as the manufacturer of telephones, appears in the fair as an exhibitor under his own name for the first time, and in a very creditable manner, for his exhibit includes, in addition to the wide range of electric supplies, standardized coils and instruments of electric measurement, for which the establishment of Charles Williams, jr., justly had such a reputation.

Charles L. Bly shows a large collection of electric supplies, also those for telegraphers' use.

Blodgett Bros. & Co. are exhibiting their well-known electric train-signal apparatus, in use on many railroads, for the purpose of signaling the departure of each train. It rings a warning bell in the waiting rooms and train house in advance of the time, and later, at the exact moment of departure, sounds another bell. It can be adjusted to any schedule by any person of ordinary skill, and is probably the only machine in the world which peruses the fourth commandment, for it automatically changes from the week-day to the Sunday schedule and back again without attention. The same exhibit also shows a watchman's electric clock, containing new improvements, also a large collection of general electric supplies.

Washburn & Moen Manufacturing Company exhibit a fine collection of electric lines and other wires; and B. S. Hale & Son show insulated and bare wire of copper and German silver for special electric purposes.

The Electrical Standard Time Company exhibit a full plant, with a master clock controlling a large number of movements. The peculiarity of this system is, that distributing clocks contain springs capable of operating the clocks for a number of hours in case of accident to the circuit. There are two magnets in each clock, one of which is used to keep the clock movement wound, and the other to keep the pendulum in synchronism. There are three furnace regulating devices, all of them of ingenious construction and worthy of careful attention. But it should be remembered that an electric furnace regulator cannot shovel coal, although it no doubt diminishes the amount of coal to be shoveled; moreover, a battery is not a perpetual motion. Two of the regulators are used in connection with clock work, and one is purely electric. The Butz regulator contains thermostats in various parts of the building, whose operation throws a clock-work into motion, and this operates the dampers for greater or less movement of draft, according to the direction in which the current is switched into the releasing mechanism.

George H. Bent exhibits a similar class of regulator.

Frank M. Sparrow exhibits a regulator which is entirely electric, the dampers being moved by the vibration of the armature on a large electro-magnet.

Among the other electric exhibits which have no competitors are those of the Orcutt railway signal, which shows the application of their system upon a working model, which is always surrounded by an attentive crowd, who watch the ingenious operation of it, and listen to the lucid explanation of those in charge of the exhibit. The limits of this article will not permit a full description of the apparatus, but suffice it to say that it differs from the usual electric railroad signals, by carrying the batteries and signal tags in the cab of the locomotive. The rails and also aerial lines form a conductor by which the apparatus is able to notify the engineer of the condition of the track for the section ahead of him. The contact from these electric conductors back to the apparatus of the signal, is made by metallic brushes at the side of the tender, which strike upon bars placed near the track. This apparatus will indicate to the engineer if the tracks are clear or the rails broken at any point in the section ahead of him, and whether the switches or drawbridges are open or closed. Each train locks a signal to the danger point on the locomotive on the section behind it. It is plain that the apparatus can be introduced at a cost very much less than other forms requiring a permanent battery plant at stations all along the road.

The Leatheroid Novelty Company exhibit a fine display of their peculiar compound, which serves such a useful purpose as an insulating material in the construction of ap-

paratus, particularly that for electric lighting. Its use is not confined to purposes where its property as an insulator is required, as it is manufactured into trunks, cases, and is used for many other purposes requiring a strong, tough material.

In one of the hardware exhibits we noticed the electric latch made by Geo. E. Thaxter, which consists of a door latch so arranged that it cannot be opened until some person on the inside presses an electric knob closing the circuit, which causes an electro-magnet to draw an obstruction in the inside, locked in such a manner as to permit its operation. The use of this lock is said to be quite general in apartment houses where a person uses a speaking tube, and the door is unlocked from apartments above without requiring the person to come down the stairs for the purpose of opening the locked door.

The Boston Scientific Society have an extensive exhibit of apparatus in connection with investigations carried on by its members, which are of scientific rather than general electric interest, although electricity enters very generally into their use as a means of aiding observation.

At the side of the organ is an elaborate astronomical clock made by H. Conant, the treasurer of the Conant Thread Company at Pawtucket, which is worthy of careful study from those interested in astronomical work. This clock contains two movements, one pendulum beating mean solar time and the other, sidereal time. The movements are indicated on two dials, whilst a third dial shows the difference between sidereal and mean solar time. The velocities of the two movements are combined in the third in a manner to show this difference, by the ingenious application of beveled gears, each of which revolves loosely in an opposite direction to the other one upon the same shaft, according to the velocity of the clockwork which drives it. Connecting the two is a third beveled gear, which remains stationary if the two velocities would be alike, but if there is any difference between the two the variation of the motion would cause this intermediate wheel to swing around the shaft, and in so doing it turns the arbor driving the hands of he differential clock. This mechanical motion, to be sure, is used in other places in machinery, particularly in the axle of the two large wheels on tricycles.

H. C. Whitcomb & Co., electrotypers, exhibit a series showing the various steps in the electrotyping process, from the first engraving to the finished work.

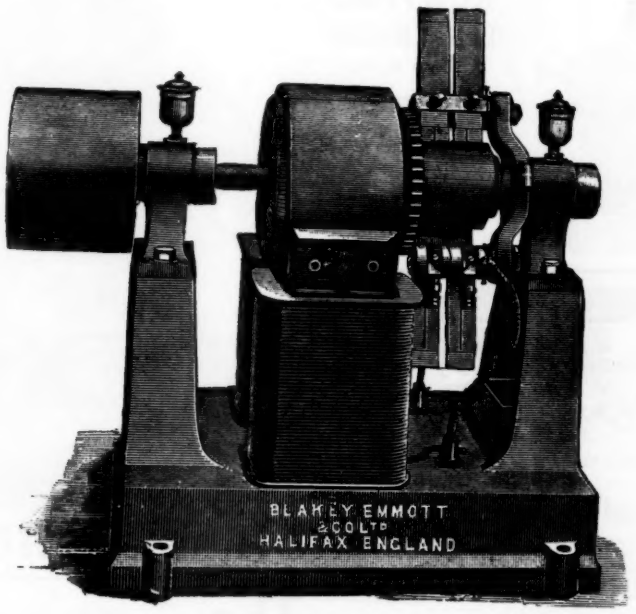
Municipal Corporation—Grant of Privilege of Lighting City.

The Supreme Court of Appeals of West Virginia recently rendered an important decision in the case of The Parkersburg Gas Company *vs.* The City of Parkersburg. In this case the court held that neither the charter of the city of Parkersburg nor the general statutes in relation to municipal corporations in force in the State in 1864 conferred upon said city the power to delegate to a private corporation the exclusive privilege of using the streets and alleys of the city for laying gas pipes and furnishing the city and its inhabitants with gas for thirty years, and that the grant by a city to a gas company, of the exclusive privilege of lighting the city with gas, does not deprive the city of the power to contract with an electric light company for lighting the city with electric light.

* * Where the untrained eye will see nothing but mire and dirt, says Sir John Lubbock, science will often reveal exquisite possibilities. The mud we find under our feet in the street is a grimy mixture of clay and sand, soot and water. Separate the sand, however. As Ruskin observes: Let the atoms arrange themselves in peace according to their nature—and you have the opal. Separate the clay, and it becomes a white earth, fit for the finest porcelain; or, if it still further purifies itself, you have a sapphire. Take the soot, and, if properly treated, it will give you a diamond. While, lastly, the water, purified and distilled, will become a dewdrop or crystallize into a lovely star. Or, again, you may see in a shallow pool either the mud lying at the bottom or the image of the sky.

The Blakey-Emmott Dynamo.

As will be seen by the annexed illustration, this machine, which is made by Messrs. Blakey, Emmott & Co., limited, of Halifax, does not materially differ from the prevailing type now being pushed by various makers; but the construction is in so far remarkable that the whole magnet is in one U-shaped forging, thus avoiding in the magnetic circuit the resistance of joints. The armature is of the Gramme type, the core being built up of thin disks of iron, and is wound with a single layer of wire. The commutator has forty hard drawn copper sections, and the current is taken off by two pairs of brushes, each brush being separately adjustable. The makers have supplied us with the following data of the construction of this machine, which is compound wound for 100 volts and 60 amperes when driven at a speed of 1,100 revolutions: "The cross-sectional area of the magnet is 30 square inches. The total cross-sectional area of actual iron in the armature is 20 square inches. The total excitation of field magnets at full load is 12,130 ampere turns. The total strength of useful field is 378 lines (English measure). The density in the magnet cores is 12.6 lines per square inch, and in the armature core 18 9 lines per square inch. The length of wire on the armature is 360 feet, which is at the rate of 43.2 inch per volt, or at a peripheral speed of 3,000 feet per minute, at the rate of 37.3 inch per volt. The total weight of copper in the machine is



THE BLAKEY-EMMOTT DYNAMO.

95 pounds, and in the armature alone 13 pounds. This gives an output of 63 watts per pound of copper in whole machine, and 461 watts per pound of copper in armature only." We may mention that the idea of making the magnetic circuit without a joint is not new. Professor Sylvanus Thompson has patented a dynamo in which the yoke, magnet limbs, and pole pieces are all cast in one piece, and Messrs. Paterson & Cooper recently brought out a dynamo having a single horseshoe magnet forged in one piece. The latter was described and illustrated on page 124, in our issue of the 29th July last.—*Industries.*

* * Experiments are being made in a car shop in Paris upon the heating of passenger cars by electricity. Messers. Courcelles and Eler introduce into the present heaters a lattice of lead bars, which are charged with electricity from a dynamo on the locomotive. Their temperature then rises, and, according to the inventors, they impart their heat to the surrounding envelope. In the experiments a Gramme machine was used, which gave a current of twenty-four amperes and fifty volts. The current passed through five heaters, in size six feet by ten inches by two inches, containing in all forty-five bars of lead. Theoretically a mechanical force of one-half horse power is required to keep the heaters warm. A train of seven cars, of three compartments each, requires nominally six, really ten, horse power.

—— The New York Electrical Accumulator Company's storage system is now used in lighting Mr. James McMillan's residence, on Jefferson avenue, Detroit, and "works like a charm." The battery is located in the barn, and supplies 150 lights.

—— The Carlisle, Pa., electric light, power and steam heating company, with a capital stock of $5,000, was granted a charter at the State Department last week. Mr. Wm. H. Woodward, superintendent of the Harrisburg and Gettysburg Railroad, Frank Gardner, of the axle works, and others are stockholders. John Stuart, Esq., the solicitor of the company, is also a stockholder.

—— P. H. Baermann, superintendent of the water works at Troy, is about to begin experiments with an incandescent Edison electric light in illuminating water beneath the surface. The experiment is similar to those now being carried on at the United States torpedo station at Newport. The light will be of sixteen candle power, enclosed in a water-tight glass bulb and protected by a wire cage. The bulb will be connected with gas pipe, through which the electric wires will run. The light will be operated by a storage battery, which is portable and can be charged before starting on any expedition. The light will be of service in looking at the bottoms of reservoirs and in examining the condition of gates or any apparatus beneath the surface of the water. The first experiments will take place at the Edison works in Schenectady.

—— Bowling Green, Ky., will put in the system of the Jenney Electric Co., Indianapolis, the city being the purchaser.

—— Improvement in gas burners is attracting the attention of a number of gas men. The electric light may be thanked for this.

—— Mr. C. H. Sewall, formerly secretary of the Schuyler Electric Manufacturing Co., has removed to New York, and will deal in general supplies.

—— James Jenney, of the Fort Wayne Jenney Co., has located at Lakeville, Mass., and will have dynamos made in the Jenks Machine shop, Middleboro.

—— Hon. N. C. Moak, of Albany, opposes the granting of a franchise to the Edison Company in that city, unless the company shall be compelled to lay pipes in every street, furnishing every citizen desiring it with light, and without compelling them to guarantee that 100 lights would be taken in the block where the light was wanted.

—— At a meeting of the board of directors of the Maine Consolidated Electric Light Company, of Portland, Me., last week, F. J. Rollins was elected president, and James English, of New Haven, treasurer. A syndicate of New Haven men, it is said, have paid $17,000 towards purchasing the interest in this Electric Light Company represented in Portland, and propose to pay off the mortgage in a short time.

ELECTRIC LIGHT NEWS

—— Detroit is agitating the question of owning its electric light plant.

—— The Fremont Electric Light and Power Company will erect a plant at Fremont, Ohio.

—— The Norristown Electric Light and Power Company will make improvements to its plant at Norristown, Pa.

—— The Sturgis Gas and Electric Light Company, Sturgis, Mich., has been incorporated, F. B. Ainger and others, incorporators.

—— The demand for the Campbell line wire has so increased that the Campbell Electrical Supply Company has been obliged to double the capacity of its plant. The Campbell line wire is not only well insulated, but it will neither melt or burn; its qualities for resisting abrasion are remarkable, and it is sold for about the same price as underwriter wire.

—— Toledo, O., has its first electric motor, and it is not used on a street railway either. It is employed by Barber & Kline, the dentists, for the purpose of generating heat, to be used in melting porcelain, a substance which requires an immense amount of heat. The motor was erected under the direct supervision of Mr. James Nolan, manager of the Toledo Electric Light Company, and it is a complete success.

—— In the manufacture of milling machinery, drills and lathes, the great increase in electrical manufacture has created a great demand. The extensive works of those well-known and reliable machinists, E. E. Garvin & Co., New York, are meeting with satisfactory success in supplying this class of machinery to electrical manufacturers, and the officers are strong believers in the great future of electricity and its applications.

—— J. K. Porter, a representative of the St. Louis agency of the Edison Electric Light Company, has been in Anna, Ill., during the past week, in consultation with several citizens of the place, who have in contemplation the project of lighting the town by electricity. The matter has been so far arranged that the project will be carried out, provided 200 lamps, of 20-candle power each, can be contracted for. The cost of the plant will be about $8,000.

—— Michigan towns seem to have a tendency toward owning everything within their limits. Bay City, Mich., has anticipated this movement in Detroit by a couple of years, and her experience does not tend to chill the ambition of Detroit in the direction of owning its electric light plant. Bay City was lighted for $12,000 annually—120 lights for $100 each. Then she decided to own her light. The plant cost $30,000. Since then the cost of maintenance has been $6,500 a year. The cost of the plant and cost of maintenance for five and a half years would be $65,750, while the rent of the former lights for the same period, it is stated, would have amounted to $66,000.

—— The Jenney Electric Light and Power Company, of Fort Wayne, Ind., is having a lot of trouble with its neighbors. The company has a great fondness for crude oil as a fuel, and persists in using it, in spite of warnings, threats and curses. About a month ago a neighbor brought suit against the company for damages, alleging that the burning of crude oil by the company rendered the neighborhood foul and ill smelling, and damaged his property. The company promised to refrain from future indulgence in crude oil, but, for some reason, went on using it just the same. Now the neighbors have united in a big suit, and state their intention to not only stop the burning of crude oil, but to obtain damages.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING NOV. 29, 1887.

373,859 Regulator for electric generators; Robert P. Sellon and William M. Mordey, Victoria Works, Belvedere Road, County of Surrey, assignors of one-third to Charles E. Webber, Victoria Works, England.

373,883 Application of accumulators to electric lighting; Thomas P. Conant, Brooklyn, N. Y., assignor to the Electrical Accumulator Company, of New York.

373,910 Telephone call box; Charles E. Scribner, Chicago, Ills., assignor to the Western Electric Manufacturing Company, same place.

373,915 Induction telegraph system; Granville T. Woods, Cincinnati, Ohio, assignor by mesne assignments to the Woods Electric Company.

373,925 Telegraph pole protector; Herschel P. Copeland, East Orange, N. J., assignor to the Western Electric Company, Chicago, Ills.

373,932 Apparatus for medicating water and administering the same; Lewis A. Harker, Columbus, and Charles C. Harker, Troy, assignors of one-third to Norris B. Peters, Miami, Ohio.

373,934 Electric arc lamp; Charles A. Homans, Winchester, Mass., assignor to Lydia K. Homans, same place, and Oscar F. Gunz, Rutherford, N. J.

373,948 Winding armatures of dynamo electric machines; Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place.

373,967 Telegraphy; 373,968 Telegraphy; Patrick B. Delany, New York, N. Y.

373,971 Commutator connection for dynamo electric machines; James W. Easton, New York, N. Y.

373,975 Electrical Horometer; Ben M. Hammond, San Antonio, Texas.

374,013 Electrical indicator for weighing scales; James E. Tarbox, Lynn, Mass.

374,017 Automatic circuit opener; Jacob P. Tirrell, Somerville, Mass., assignor to the Electric Gas Lighting Company, Portland, Me.

374,028 Electric door opener; Albert C. Woehrle, New York, N. Y.

374,036 Circuit closer; Charles B. Bosworth, Everett, Mass., assignor to the Electric Gas Lighting Company, Portland, Me.

374,038 Telegraph instrument; Charles G. Burke, Richmond Hill, N. Y.

374,072 Electric temperature regulator; Warren S. Johnson, Milwaukee, Wis., assignor to the Johnson Electric Service Company, same place.

374,088 Electric organ action: Hilborne S. Roosevelt, New York, N. Y.; Alfred Roosevelt executor of said Hilborne L. Roosevelt, deceased.

374,103 Manufacture of telegraph and other poles or posts; David Wilson, County of Essex England.

374,129 Arc light; Clarence B. Noble, Cleveland, Ohio.

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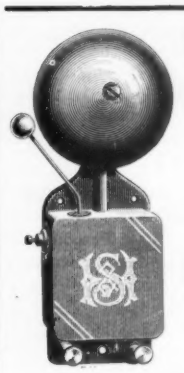

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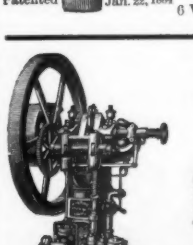

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Sperry Electric Light Motor & Car Brake Co., 201 Royal Insurance Building
J. H. Reid, General Manager of the Mather Electric Light Co., Chicago.
Wm. H. Purdey, Comm. of Public Works, Chicago
John Mab, Chief Engin'r of Board of Trade, Chic.
C. J. Meimes, Gen'l Sup't Thomson-Houston Light, Omaha, Neb.
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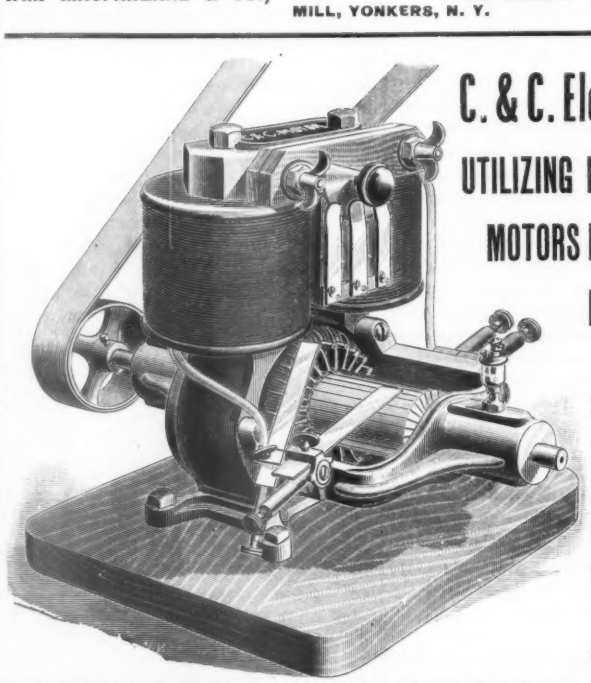

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